EXERCISE 1

Repeated multiplication

Interactive test

From the school book



Remember Understand Apply Problem Solving

1 **Calculate each of the following , then put the result in the simplest form :**

1 📖 $(\frac{1}{3})^4$

2 $(\frac{3}{5})^2$

3 📖 $(-\frac{1}{7})^3$

4 📖 $(-\frac{3}{4})^4$

5 $(\frac{5}{9})^0$

6 $(-2\frac{1}{2})^3$

7 $(0.04)^2$

8 $(1.5)^3$

9 $(-3.2)^2$

2 **Calculate each of the following , then put the result in the simplest form :**

1 $8 \times (\frac{1}{2})^3$

2 📖 $(-\frac{3}{4})^2 \times \frac{8}{27}$

3 📖 $(-\frac{3}{5})^3 \times (-\frac{25}{27})$

4 $(\frac{3}{5})^2 \div (-\frac{9}{125})$

5 $(\frac{4}{3})^2 \times (\frac{3}{2})^3$

6 📖 $(-\frac{5}{6})^2 \div 3\frac{3}{4}$

7 $(2\frac{1}{2})^2 \times \frac{4}{25}$

8 📖 $2\frac{7}{9} \div (-1\frac{2}{3})^2$

3 **Calculate each of the following , then put the result in the simplest form :**

1 $(\frac{4}{5})^2 \times \frac{5}{16} \times (\frac{2}{3})^0$

2 $\frac{3}{4} \times (-\frac{2}{3})^3 \times (\frac{3}{2})^2$

3 $(-\frac{5}{3})^4 \times (-\frac{3}{5})^3 \times (-1)^7$

4 📖 $(-\frac{2}{3})^3 \times (\frac{1}{3})^3 \div (-\frac{2}{9})^2$

5 📖 $[(\frac{5}{2})^3 \div (\frac{3}{2})^4] \times (\frac{3}{5})^3$

6 📖 $(-\frac{1}{2})^3 \div [8 \times (-\frac{1}{2}) \times \frac{3}{4}]$

4 Choose the correct answer from those given :

1 The multiplicative inverse of the number $\left(\frac{2}{5}\right)^0$ is .....

(a) $\frac{5}{2}$ (b) $-\frac{2}{5}$ (c) 1 (d) 0

2 The additive inverse of the number $(-3)^0$ is .....

(a) 1 (b) -3 (c) 3 (d) $-(3)^0$

3 The multiplicative inverse of the number $(-1)^3$ is .....

(a) $(-1)^3$ (b) $(-1)^2$ (c) 1^3 (d) 1^2

4 The additive inverse of the number $\left(-\frac{2}{5}\right)^2$ is .....

(a) $\frac{4}{25}$ (b) $-\frac{4}{25}$ (c) $\frac{25}{4}$ (d) $-\frac{25}{4}$

5 $\left(\frac{1}{4}\right)^0 + \frac{1}{4} =$ .....

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{5}{4}$ (d) $\frac{2}{4}$

6 $\left(\frac{5}{3}\right)^2 \times \left(\frac{3}{5}\right)^0 =$ .....

(a) $\frac{5}{3}$ (b) $\frac{25}{9}$ (c) 0 (d) 1

7 If $x = y$, then $\left(\frac{3}{5}\right)^{x-y} =$ .....

(a) $\frac{3}{5}$ (b) $\frac{5}{3}$ (c) 1 (d) 0

8 $\left(\frac{a}{b}\right)^2 \times \frac{b^2}{a^2} =$ ..... (where $ab \neq 0$)

(a) ab (b) $\left(\frac{a}{b}\right)^4$ (c) $(ab)^0$ (d) $\frac{a}{b}$

9 If $x = -\frac{1}{2}$ and $y = 3$, then $x^y =$ .....

(a) $\frac{1}{8}$ (b) $-\frac{1}{8}$ (c) $\frac{1}{6}$ (d) $-\frac{1}{6}$

10 If $y^{26} + y^{27} = 0$, then $y =$ .....

(a) 1 (b) -1 (c) 2 (d) -2

5 Complete the following :

1 $\frac{8}{27} = \left(\frac{2}{3}\right)^{.....}$

2 $\frac{9}{16} = \left(\frac{3}{4}\right)^{.....}$

3 $-\frac{64}{125} = \left(-\frac{4}{5}\right)^{.....}$

4 $2\frac{1}{4} = \left(\frac{3}{2}\right)^{.....}$

5 $0.027 = \left(\frac{3}{10}\right)^{.....}$

6 $64\ \% = \left(\frac{4}{5}\right)^{.....}$

7 If $\frac{x}{y} = -\frac{2}{5}$, then $\left(\frac{x}{y}\right)^3 =$ .....

8 If $x = \frac{1}{2}$ and $y = \frac{2}{3}$, then $x^2 y^2 =$ .....

9 📖 $(-\frac{1}{2})^3 - (-\frac{1}{2})^2 =$ .....

10 $2^2 + 2^2 = 2^{.....}$

11 $\frac{3}{4}$, $\frac{9}{16}$, $\frac{27}{64}$, ... , ... (in the same pattern)

12 The greater number of the two numbers $(\frac{1}{4})^2$ and $(-\frac{8}{3})^5$ is .....

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6 If $x = -\frac{2}{3}$ and $y = -\frac{1}{3}$, find the value of : $x^2 + y^3$ « $\frac{11}{27}$ »

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7 If $a = \frac{2}{3}$ and $b = -\frac{4}{3}$, find the value of : $|a^3 \div b^3|$ « $\frac{1}{8}$ »

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8 If $x = 0.5$, $y = -\frac{2}{3}$ and $z = -3$, find the value of : $9xy^2 - z^3$ « 29 »

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9 📖 If $a = -\frac{1}{2}$, $b = 2$ and $c = \frac{3}{4}$, find the numerical value of : $a^3 b^2 + b^2 c - 8abc$ « $8\frac{1}{2}$ »

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10 📖 **If $x = -\frac{3}{2}$, $y = \frac{1}{2}$ and $z = -\frac{4}{3}$, find the numerical value of each of the following in its simplest form :**

1 $x^2 y^2 z^2$ « 1 »

2 $x^2 \div z^2$ « $\frac{81}{64}$ »

3 $x^2 - y z^2$ « $\frac{49}{36}$ »

4 $\frac{x^2 y^2 z^2}{x + y}$ « – 1 »

Geometric Application

11 If $V = \ell^3$ where V is the volume of a cube and ℓ is its edge length , then calculate the volume of the cube whose edge length is $1\frac{1}{2}$ cm. « $\frac{27}{8}$ cm^3 »

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12 Choose the correct answer from those given :

1 If $y = (\frac{1}{2})^x$ where $x \in \{0 , 1 , 2 , 3\}$, then y takes its maximum value when $x =$ .....

(a) 0 (b) 1 (c) 2 (d) 3

2 If $y = (-\frac{2}{5})^x$ where $x \in \{0 , 1 , 3 , 4\}$, then y takes its minimum value when $x =$ .....

(a) 0 (b) 1 (c) 3 (d) 4

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13 Arrange the following numbers ascendingly without expanding :

$(\frac{2}{3})^2 , (-\frac{2}{3})^3 , (-\frac{1}{3})^2 , (-\frac{1}{3})^3$

EXERCISE 2 ?

Non-negative integer powers

Interactive test

From the school book



● Remember ● Understand ○ Apply Problem Solving

1 **Calculate each of the following , then put the result in the simplest form :**

1 $(\frac{2}{3})^3 \times (\frac{2}{3})^2$

2 $(-\frac{2}{3})^3 \times (\frac{2}{3})^2$

3 $\frac{1}{5} \times (-\frac{1}{5})^4$

4 $(\frac{1}{6})^9 \div (\frac{1}{6})^8$

5 $(\frac{2}{7})^5 \div (\frac{2}{7})^3$

6 $(-\frac{3}{5})^7 \div (\frac{3}{5})^5$

7 $(-\frac{5}{2})^2 \div 2\frac{1}{2}$

8 $(\frac{1}{2})^2 \times \frac{1}{2} \times (\frac{1}{2})^3$

9 $(\frac{4}{5})^8 \div (\frac{4}{5})^6 \times \frac{4}{5}$

2 **Calculate each of the following , then put the result in the simplest form :**

1 $\frac{3^7 \times 3^3}{3^6}$

2 $\frac{2^6 \times 2}{2^3 \times 2^4}$

3 $\frac{(-5)^4 \times 5^2}{5^3}$

4 $\frac{(-2)^5 \times 2^4}{(-2)^3 \times 2^2}$

5 $\frac{(-3)^5 \times (-2)^7}{(-3)^3 \times (-2)^5}$

6 $\frac{x^4 \times y^3 \times x^5}{x^6 \times y^2}$

3 **Find each of the following in the simplest form :**

1 $\left(\frac{a\,b}{c}\right)^5$

2 $\left(\frac{5x}{3y}\right)^2$

3 $\left(-\frac{2\,a\,b}{3\,c}\right)^4$

4 $\left(\frac{x^2}{y^3}\right)^2$

5 $\left(\frac{a^3 b^2}{c^5}\right)^3$

6 $\left(-\frac{c^2}{d}\right)^3$

7 $\left(-\frac{x^3}{y^2}\right)^2$

8 $\frac{(4x^3 y^2)^7}{(2x^2 y)^7}$

9 $\frac{(2a)^3 \times (2a)^4}{(-2a)^6 \times a}$

4 **Calculate each of the following , then put the result in the simplest form :**

1 $[(\frac{1}{2})^2]^2$

2 $[(-\frac{3}{2})^2]^5$

3 $[(2\frac{1}{2})^3]^2$

4 $(\frac{3}{5})^{10} \times (\frac{5}{3})^{10}$

5 $\left((\frac{2}{7})^2\right)^3 \times (\frac{7}{2})^6$

6 $(2\frac{1}{2})^2 \times (-\frac{2}{5})^2$

5 **Match each expression in column (A) with an equivalent expression in column (B) :**

Column (A)	Column (B)
(1) $(x^2)^n$	(a) x^{n^2}
(2) $(x^n)^n$	(b) $\frac{3\,m^c}{2\,n^c}$
(3) $(x\,y^a)^b$	(c) $27\,x^{3a}$
(4) $\left(\frac{x}{y^a}\right)^b$	(d) $\frac{3^c\,m^c}{2^c\,n^c}$
(5) $(-3\,x^a)^3$	(e) x^{2n}
(6) $(3\,x^a)^3$	(f) $-27\,x^{3a}$
(7) $\frac{3}{2}\left(\frac{m}{n}\right)^c$	(g) $\frac{n^b}{y^{ab}}$
(8) $\left(\frac{3\,m}{2\,n}\right)^c$	(h) $x^b\,y^{ab}$
	(i) $\frac{x^b}{y^{ab}}$
	(j) $x\,y^{ab}$

6 **Choose the correct answer from those given :**

1 $3^2 \times 3^5 =$ .....

(a) 3^7 (b) 3^3 (c) 3^{10} (d) 3^{25}

2 $5^2 + 5^2 =$ .....

(a) 10^2 (b) 10^4 (c) 5^4 (d) 50

3 $3^5 \times 2^5 =$ .....

(a) 5^{10} (b) 6^{10} (c) 6^5 (d) 6^{25}

4 $(5a)^0 =$ ..... , $a \neq 0$

(a) 5 (b) a (c) 5 a (d) 1

5 $3^{(2^3)} =$ .....

(a) 3^6 (b) 3^5 (c) 3^8 (d) 3^{23}

6 $(5^2)^3 =$ .....

(a) 5^6 (b) 5^5 (c) 5^{23} (d) 5

7 $3^{10} + 3^{10} + 3^{10} =$ .....

(a) 3^{10} (b) 3^{30} (c) 9^{10} (d) 3^{11}

8 $4^x + 4^x + 4^x + 4^x =$ .....

(a) 4^{x+4} (b) 4^{4x} (c) 4^{x+1} (d) $4x^4$

9 $\frac{(3^2)^5}{(3^5)^2} =$ .....

(a) 3^{10} (b) 3^{52} (c) 3^{25} (d) 1

10 $\frac{(x^2)^3}{x^3} =$ ..... , $x \neq 0$

(a) x^6 (b) x^2 (c) x^3 (d) x

11 $(2y)^3 =$ .....

(a) $2y^3$ (b) 8 y (c) $8y^3$ (d) 23 y

12 $(b^3)^4 =$ .....

(a) b^{34} (b) b^7 (c) $b^3 \times b^3 \times b^3$ (d) $b^4 \times b^4 \times b^4$

13 The quarter of the number $4^{20} =$ .....

(a) 4^5 (b) 4^{10} (c) 4^{19} (d) 2^{10}

7 **Simplify to the simplest form :**

$\frac{(2y)^4 \times (3y)^2}{12y^5}$, then find the value of the result at $y = -\frac{1}{6}$ «– 2 »

8 If $a = \frac{5}{3}$, $b = -\frac{3}{2}$ and $c = \frac{2}{5}$, **find the numerical value of each of :**

1 $\frac{(a^2 c^2)^2}{b}$ 2 $\left(\frac{2ab}{5c}\right)^3$ «$-\frac{32}{243}$, $-\frac{125}{8}$ »

9 If $x = -\frac{1}{2}$, $y = \frac{3}{4}$ and $z = -\frac{3}{2}$,

find the numerical value of each of the following in the simplest form :

1 $x^3 y^2$ 2 $y^3 x^2$ 3 $\frac{x^3}{y^2 z^2}$

«$-\frac{9}{128}$, $\frac{27}{256}$, $-\frac{8}{81}$ »

10 **Complete the following :**

1 $\left(\left(\frac{7}{9}\right)^3\right)^4 = \frac{7^{12}}{3^{\cdots\cdots}}$

2 If $\left(\frac{3}{4}\right)^5 \times x = \left(\frac{3}{4}\right)^7$, then $x =$ .....

3 The greater number of the two numbers $\left((-3)^5\right)^3$ and $\left((-3)^2\right)^4$ is .....

4 $\left((-1)^5\right)^2 - \left((-1)^3\right)^2 =$ .....

5 $\frac{4^4}{4^3} + \frac{4^3}{4^2} + \frac{4^2}{4} + 4 = 2$ .....

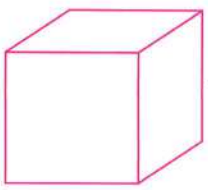
6 $2^{2x} \times 4^x = 4^{\cdots\cdots}$

Geometric Applications

11 Find the area of the square whose side length is $\frac{2x}{5}$ cm.



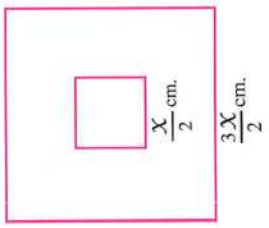
12 Find the volume of the cube whose edge length is $\frac{3a^3}{7}$ cm.



13 **In the opposite figure :**

A square is drawn inside another square.

Find the area of the shaded part.



For excellent pupils

14 If four times a number is 4^3 , find $\frac{3}{4}$ this number. « 12 »

15 If $x = \frac{1}{5}$ and $y = 5$, find the value of : $x^{15}\, y^{14}$ « $\frac{1}{5}$ »

16 **Prove that :**

1 $5^{x+2} - 5^{x+1} = 20 \times 5^x$

2 $3^{15} + 3^{14}$ is divisible by 4



EXERCISE **3** ?

Negative integer powers

Interactive test

From the school book



● Remember ● Understand ○ Apply Problem Solving

1 **Evaluate each of the following :**

1 📖 4^{-1} | 2 📖 5^{-2} | 3 $\left(\frac{1}{2}\right)^{-1}$

4 $\left(-\frac{2}{3}\right)^{-2}$ | 5 $(0.2)^{-2}$ | 6 $(1.2)^{-1}$

2 **Evaluate each of the following :**

1 📖 $3^7 \times 3^{-3}$ | 2 $2^{-2} \times 2^{-3}$ | 3 📖 $\frac{3}{3^{-2}}$ | 4 📖 $\frac{6^{-2}}{6^{-3}}$

3 **Evaluate each of the following :**

1 📖 $(5^{-1})^{-3}$ | 2 $(3^{-2})^2$ | 3 $(0.25)^{-2}$

4 $(2^{-1} \times 2^{-2})^3$ | 5 📖 $\left(\frac{3^{-1}}{3}\right)^2$ | 6 📖 $\left(\frac{8^4}{8^{-4}}\right)^0$

4 **Evaluate each of the following :**

1 📖 $\frac{8 \times 8^{-2}}{8^{-3}}$ | 2 📖 $\frac{7^{-2} \times 7^5}{7^3}$ | 3 $\frac{2^5 \times 2^{-2}}{2^{-4} \times 2^3}$

4 $\frac{2^3 \times 2^{-3}}{(2^2)^2}$ | 5 $\frac{(3^{-2})^3}{3^{-2} \times 3^{-6}}$ | 6 📖 $\left(\frac{9^3 \times 9}{9^5}\right)^{-3}$

7 $\left(\frac{2^5 \times 3^2}{3^4 \times 2^3}\right)^{-1}$ | 8 📖 $(3^0 \times 2^{-2})^{-2}$ | 9 $\frac{(10)^2 \times (0.01)^3}{(10)^{-3}}$

5 **Simplify each of the following and write the result in terms of positive exponents , where the denominator does not equal zero :**

1 $7x^{-1}$

2 $x^{-1}y^{2}$

3 $a^{-2}b^{-3}$

4 $x^{3} \times x^{-5}$

5 $x^{3} \times x^{-2} \times x^{-1}$

6 $\frac{c^{-5}}{c^{2}}$

7 $(a^{-2})^{3}$

8 $(b^{-1})^{-3}$

9 $(a^{2} \times a^{-5})^{2}$

10 $(x^{2})^{-3} \times (x^{-3})^{-2}$

11 $\left(\frac{y^{5}}{y^{-2}}\right)^{-3}$

12 $\frac{x^{2} \times x^{-3}}{x^{-4} \times x}$

13 $\frac{(x^{2})^{-3} \times (x^{-1})^{2}}{x^{-3} \times x^{-4}}$

14 $\frac{a^{-1}}{b^{2}}\left(\frac{a^{-1}}{2b^{2}}\right)^{-2}$

15 $(x + x^{-1})^{2}$

6 **Complete the following :**

1 $2^{-3} \times c^{0} =$ .....

2 $(b^{-1})^{-3} = b^{.....}$

3 $2x^{-3} = \frac{2}{.....}$

4 $(3x^{-1})^{2} = 9x^{.....} = \frac{9}{.....}$

5 $(3y^{-2})^{-2} =$ .....

6 $(3a^{2})^{-1} = \frac{1}{.....}$

7 $2x^{-2}y^{-3} = \frac{2}{.....}$

8 $\frac{x^{-5}}{y^{-5}} = (.....)^{5}$

9 $(\frac{1}{2})^{2} + 2^{0} - (2)^{-2} =$ .....

10 $(x^{2})^{.....} = \frac{1}{x^{4}}$

11 $2^{10} \times 2^{-10} = 3^{.....}$

12 $a^{-5} + 1 = a^{-5}$ (..... + ...) , where $a \neq 0$

13 If $x = \frac{1}{2}$, $y = \frac{1}{4}$, then $(x - y)^{-1} =$ .....

7 **Choose the correct answer from those given :**

1 If $a^{-1} = \frac{2}{3}$, then a = ...

(a) $-\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $-\frac{3}{2}$ (d) 1

2 If $a = 7^{x}$ and $b = 7^{-x}$, then $a \times b =$ .....

(a) 7^{2x} (b) 49^{2x} (c) 1 (d) 0

3 $\frac{5^{x}}{5^{-y}} =$ .....

(a) $5^{x \div y}$ (b) 5^{x-y} (c) 5^{x+y} (d) $-\frac{x}{y}$

4 $\frac{6a^{2}x^{4}}{2a^{3}x^{3}} =$ .....

(a) $3ax$ (b) $3a^{5}x^{7}$ (c) $\frac{3x}{a}$ (d) $\frac{3}{ax}$

5 $\frac{(-2s^{2}t)^{3}}{(-4st^{2})^{2}} =$ .....

(a) $-\frac{s^{3}}{2t}$ (b) $-\frac{s^{4}}{2t}$ (c) $\frac{s^{5}}{2t^{2}}$ (d) $\frac{s^{4}}{t}$

6 📖 $\left(\frac{m^2}{n^{-3}}\right)^{-1}\left(\frac{3m^{-2}}{n^{-2}}\right)^{-2} =$ .....

(a) $\frac{9m^2}{n^7}$ (b) $\frac{m^2}{9n^7}$ (c) $\frac{m^2}{9n}$ (d) $\frac{9m^6}{n}$

7 📖 $\frac{(2ab^{-2})^0}{3^0 a^{-2} b} =$ .....

(a) $\frac{a^3}{3b^3}$ (b) a^2 (c) 1 (d) $\frac{a^2}{b}$

8 If $a^x = 2$ and $a^{-y} = 3$, then $a^{x-y} =$ .....

(a) 1 (b) – 1 (c) $\frac{2}{3}$ (d) 6

9 If $x y^{-1} = \frac{1}{2}$, then $\frac{y}{x} =$ .....

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) 1 (d) 2

10 $3^{-1} + 3^{-1} + 3^{-1} =$ .....

(a) 3^{-3} (b) 3^3 (c) 9^{-3} (d) 1

11 The multiplicative inverse of 5^{-1} is .....

(a) $\frac{1}{5}$ (b) 5 (c) – 5 (d) $-\frac{1}{5}$

12 $(\frac{3}{5})^2 \times (\frac{5}{3})^{-2} =$ .....

(a) $(\frac{3}{5})^4$ (b) 1 (c) $(\frac{3}{5})^{-4}$ (d) 0

8 Complete each of the following by the suitable sign of (>) , (<) or (=) :

1 2^{10} ..... 2^{-10} | 2 3^{-20} ..... 3^2 | 3 5^{-15} ..... 2^{-15}

4 $(-7)^{-2}$ ..... $(-7)^{19}$ | 5 $(-1)^{-6}$ ..... $(-1)^{-9}$ | 6 $(-1)^{-20}$ ..... $(1)^{-10}$

9 📖 Why b^{-3} is not defined when $b = 0$?

10 Calculate the value of $(-\frac{3}{5})^x \times (\frac{3}{5})^y$ in each of the following cases :

1 $x = -2$ and $y = 2$ « 1 » 2 $x = -1$ and $y = 2$ « $-\frac{3}{5}$ »

11 If $x = -\frac{1}{3}$, $y = \frac{2}{3}$, then find in the simplest form the numerical value of the expression : $(\frac{y}{x^2})^{-2}$ « $\frac{1}{36}$ »

12 **Simplify to the simplest form :** $\frac{2^{10} \times 3^4}{(12)^5}$ « $\frac{1}{3}$ »

13 **Simplify to the simplest form :**

$\frac{6^{2n+1} \times 4^{-n}}{2^n \times 3^{2n+1}}$, then find the value of the result when n = 3 « $\frac{1}{4}$ »

Life Applications



14 The flea can jump at a height of 200 times of its length.
If a flea of length 2^{-4} inches can jump at a height of 2^3 inches
What does this height represent according to the length of the flea ?

15 The population of a city has been growing exponentially. It is estimated that in (t) years the population (p) will be : $p = 2\,(1.03)^t$ million.

1 What will the population be in 2 years ? 2 What is the population now ?

3 What was the population last year ?

For excellent pupils

16 **If $2^n = 3$, find the value of :**

1 2^{n+1} 2 4^n 3 4^{-n} 4 2^{n-1} « 6 , 9 , $\frac{1}{9}$, $\frac{3}{2}$ »

17 **If a = 5 and $b = 5^{-1}$, find the value of :** $a^{51}\, b^{50}$ « 5 »

18 **Without expanding , arrange the following ascendingly by inspection :**

$(-2)^{-15}$, $(-5)^{20}$, $(-2)^{15}$, 2^{-20} , $(-5)^{15}$, $(-2)^{20}$



Accumulative test 1 on lesson 1 – unit 1

1 Choose the correct answer from those given :

1 The additive inverse of the number $\left(\frac{-2}{3}\right)^{\text{zero}}$ is .....

(a) zero (b) 1 (c) – 1 (d) $\frac{2}{3}$

2 The multiplicative inverse of the number $(-1)^3$ is .....

(a) $(-1)^3$ (b) $(-1)^2$ (c) 1^3 (d) 1^2

3 64 % = $\left(\frac{4}{5}\right)^{\cdots\cdots}$

(a) 1 (b) 2 (c) 3 (d) 4

4 $(2y)^3$ = ...

(a) $2y^3$ (b) $8y^3$ (c) 8 y (d) 32 y

5 If a = b , then : $\left(\frac{4}{5}\right)^{a-b}$ = ...

(a) zero (b) $\frac{4}{5}$ (c) $\frac{5}{4}$ (d) 1

6 $(-1)^{13}$ ..... $(-1)^2$

(a) > (b) < (c) = (d) ≥

7 $\left(\frac{-1}{2}\right)^2 - \left(\frac{-1}{2}\right)^3$ = ...

(a) $\frac{1}{8}$ (b) $\frac{-1}{8}$ (c) $\frac{3}{8}$ (d) $\frac{-3}{8}$

8 If $a^{26} + a^{27}$ = zero , then a = ...

(a) 1 (b) – 1 (c) 2 (d) – 2

2 Find the value of the following in the simplest form : $\left(\frac{-2}{3}\right)^3 \times \left(\frac{1}{3}\right)^3 \div \left(\frac{-2}{9}\right)^2$

3 If $X = \frac{-1}{2}$, $y = \frac{3}{4}$, $z = \frac{3}{8}$

find in the simplest form the numerical value of : $(X + y)^3 \div z$

Accumulative test 2 till lesson 2 – unit 1

1 Choose the correct answer from those given :

1 $2^3 + 2^3 =$ .....

(a) 2^6 (b) 2^9 (c) 2^4 (d) 1

2 $2^3 \times 2^5 =$ .....

(a) 2^2 (b) 2^8 (c) 2^{15} (d) 2

3 $3^x + 3^x + 3^x =$ .....

(a) 9^x (b) 27^x (c) $3x^3$ (d) 3^{x+1}

4 $0.027 = \left(\frac{3}{10}\right)^{.....}$

(a) 1 (b) 2 (c) 3 (d) 4

5 The additive inverse of the number $(-1)^4$ is .....

(a) 1 (b) 4 (c) -4 (d) -1

6 $2^7 \times 3^7 =$ .....

(a) 5^7 (b) 6^7 (c) 6^{14} (d) 6^{49}

7 If $a^x = 2$, $a^y = 3$, then : $a^{x+y} =$ .....

(a) 1 (b) -1 (c) $\frac{2}{3}$ (d) 6

8 The quarter of the number 2^{16} equals .....

(a) 2^4 (b) 2^{12} (c) 2^{15} (d) 2^{14}

---

2 [a] Find the value of : $\frac{(-4)^5 \times (-3)^7}{(-4)^3 \times (-3)^5}$

[b] Simplify to the simplest form : $\frac{(-4\,a^3\,b^4)^2}{(-2\,a\,b^2)^4}$ such that $a\,b \neq$ zero

, then find the numerical value of the result if $a = 2$, $b = 1$

---

3 If $a = \frac{-1}{2}$, $b = 2$, $c = \frac{3}{4}$

Find the numerical value of the expression : $a^3\,b^2 + b^2c - 8\,abc$

Accumulative test 3 till lesson 3 – unit 1

1 Choose the correct answer from those given :

1 $\left(-\frac{3}{5}\right)^{-2}$ = ...

(a) $\frac{25}{9}$ (b) $\frac{-25}{9}$ (c) $\frac{9}{25}$ (d) $\frac{-9}{25}$

2 If $x\,y^{-1} = \frac{1}{2}$, then : $\frac{y}{x}$ = ...

(a) $\frac{1}{2}$ (b) $\frac{-1}{2}$ (c) 1 (d) 2

3 The multiplicative inverse of the number 5^{-2} is .....

(a) 25 (b) $\frac{1}{25}$ (c) – 25 (d) $-\frac{1}{25}$

4 If $2^{-7} + 2^{-7} = 2^{m}$, then m = ...

(a) – 7 (b) – 6 (c) – 8 (d) zero

5 Double the number 2^{10} is .....

(a) 4^{10} (b) 2^{20} (c) 2^{11} (d) 4^{20}

6 $3^{10} + 3^{10} + 3^{10}$ = ...

(a) 3^{10} (b) 3^{30} (c) 3^{11} (d) 9^{10}

7 $\left(\frac{-2}{3}\right)^{2}$ = ...

(a) 4 (b) 9 (c) $\frac{-4}{9}$ (d) $\frac{4}{9}$

8 $(2)^{-3}$ ..... $(-2)^{3}$

(a) > (b) < (c) = (d) ≤

---

2 [a] Calculate the value of : $\frac{(10)^2 \times (0.01)^3}{10^{-3}}$

[b] If $x = \frac{1}{2}$, $y = \frac{3}{4}$ **Find the value of :** $\left(\frac{x^2}{y}\right)^2$

---

3 Simplify to the simplest form : $\frac{x^5 \times x^{-3}}{x^{-2} \times x^6}$, then find the numerical value of the result at $x = \frac{1}{2}$

EXERCISE **1** ?

Deductive proof

Interactive test

From the school book

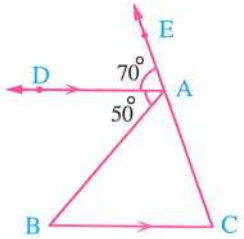


● Remember ● Understand ○ Apply Problem Solving

1 **In the opposite figure :**

$\overrightarrow{AD} // \overline{BC}$, m (∠ DAB) = 50° and m (∠ DAE) = 70°

Find the measures of the angles of Δ ABC



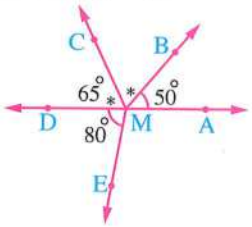
Complete the following table by writting the reason of each step of the solution steps :

Mathematical Statement	The reason
m (∠ DAB) = 50° , m (∠ DAE) = 70°	1 .....
m (∠ CAB) = 180° – (50° + 70°) = 60°	2 .....
$\overrightarrow{AD} // \overline{BC}$	3 .....
m (∠ C) = m (∠ DAE) = 70°	4 .....
m (∠ B) = m (∠ DAB) = 50°	5 .....

2 **In the opposite figure :**

m (∠ AMB) = 50° , m (∠ EMD) = 80° , $\overrightarrow{MC}$ bisects ∠ BMD and m (∠ CMD) = 65°

Complete the following proof to find m (∠ AME)



Given .....

R.T.F. .....

Proof

∵ $\overrightarrow{MC}$ bisects ∠ ..... (given)

∴ m (∠ BMC) = m (∠ .....) = ...°

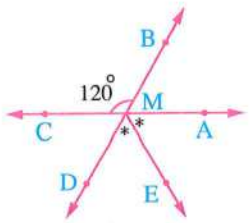
∵ m (∠ AMB) + m (∠ BMC) + m (∠ CMD) + m (∠ DME) + m (∠ AME) = ...°

∴ m (∠ AME) = ...° – .....° = ...° (The req.)

3 **In the opposite figure :**

$\overleftrightarrow{AC} \cap \overleftrightarrow{BD} = \{M\}$, m (∠ BMC) = 120°

and $\overrightarrow{ME}$ bisects ∠ AMD



Complete the following proof to find m (∠ EMC)

Given .....

R.T.F. .....

Proof

∵ $\overleftrightarrow{AC} \cap \overleftrightarrow{BD} = \{M\}$

∴ m (∠ BMC) = m (∠ .....) (V.O.A.)

∴ m (∠ .....) = 120°

∵ $\overrightarrow{ME}$ bisects ∠ AMD

∴ m (∠ .....) = m (∠ .....)

∴ m (∠ EMD) = $\frac{\text{.....}}{\text{.....}}$ = ...°

∵ M ∈ $\overleftrightarrow{BD}$

∴ m (∠ BMC) + m (∠ .....) = 180°

∴ m (∠ DMC) = ...° – .....° = ...°

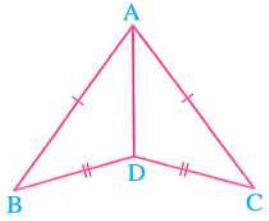
∵ m (∠ EMC) = m (∠ .....) + m (∠ .....)

∴ m (∠ EMC) = ...° + ...° = ...° (The req.)

---

4 **In the opposite figure :**

AB = AC , BD = CD



Complete the following proof to prove that $\overrightarrow{AD}$ bisects ∠ BAC

Given .....

R.T.P. .....

Proof

∵ In Δ ADB , ... :

AB = ... (given)

..... = CD (given)

$\overline{AD}$ .....

∴ Δ ADB ≡ Δ ..... , then we deduce that :

m (∠ .....) = m (∠ .....)

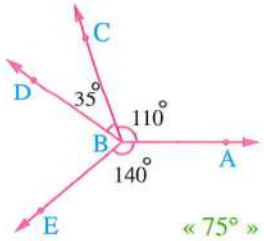
∴ $\overrightarrow{AD}$ bisects ∠ ..... (Q.E.D.)

5 **In the opposite figure :**

$m(\angle ABC) = 110°$, $m(\angle CBD) = 35°$

and $m(\angle ABE) = 140°$

Find : $m(\angle EBD)$



« 75° »

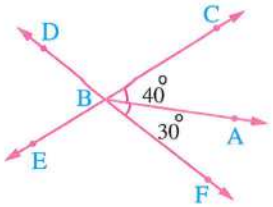
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6 **In the opposite figure :**

$\overleftrightarrow{CE} \cap \overleftrightarrow{FD} = \{B\}$,

$m(\angle ABC) = 40°$ and $m(\angle ABF) = 30°$

Find : $m(\angle DBE)$



« 70° »

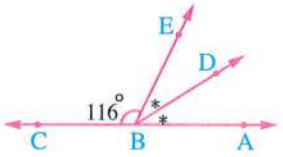
---

7 **In the opposite figure :**

$B \in \overleftrightarrow{AC}$, $m(\angle CBE) = 116°$

and $\overrightarrow{BD}$ bisects $\angle ABE$

Find : $m(\angle ABD)$



« 32° »

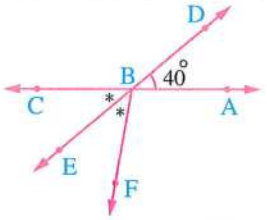
---

8 **In the opposite figure :**

$\overleftrightarrow{AC} \cap \overleftrightarrow{DE} = \{B\}$, $m(\angle ABD) = 40°$

and $\overrightarrow{BE}$ bisects $\angle CBF$

Find : $m(\angle ABF)$



« 100° »

---

9 **In the opposite figure :**

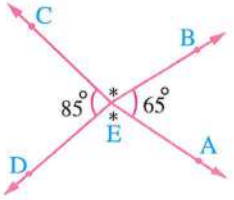
$\overrightarrow{EA} \cap \overrightarrow{EB} \cap \overrightarrow{EC} \cap \overrightarrow{ED} = \{E\}$

If $m(\angle BEC) = m(\angle AED)$

, $m(\angle AEB) = 65°$, $m(\angle CED) = 85°$

Find : $m(\angle BEC)$

Are A , E and C on the same straight line ? Why ?



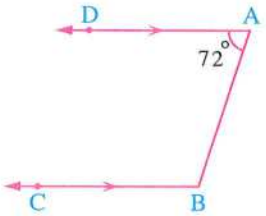
« 105° »

---

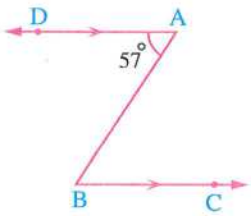
10 **In each of the following figures ,**

If $\overrightarrow{AD} // \overrightarrow{BC}$ **Find :** $m(\angle ABC)$, giving reason.

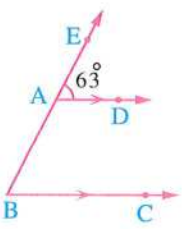
1



2



3



11 **In the opposite figure :**

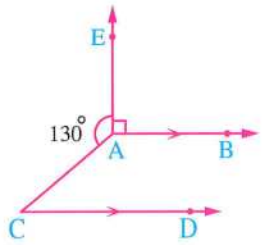
$\overrightarrow{AB} // \overrightarrow{CD}$

, m (∠ EAC) = 130°

and m (∠ EAB) = 90°

Find : 1 m (∠ BAC)

2 m (∠ C)



« 140° , 40° »

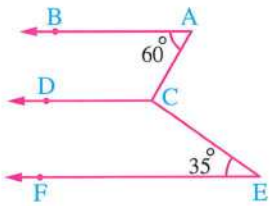
---

12 **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD}$, $\overrightarrow{AB} // \overrightarrow{EF}$

, m (∠ A) = 60° and m (∠ E) = 35°

Find : m (∠ ACE)



« 95° »

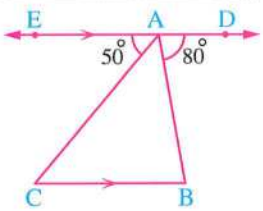
---

13 **In the opposite figure :**

$\overleftrightarrow{DE} // \overline{BC}$, $A \in \overline{DE}$, m (∠ DAB) = 80°

and m (∠ EAC) = 50°

Find the measures of the angles of Δ ABC



« m (∠ BAC) = 50° , m (∠ B) = 80° , m (∠ C) = 50° »

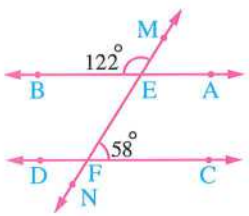
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14 📖 **In each of the following figures,**

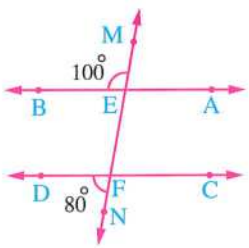
If $\overleftrightarrow{MN}$ intersects $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$ at E and F respectively,

Prove that : $\overleftrightarrow{AB} // \overleftrightarrow{CD}$

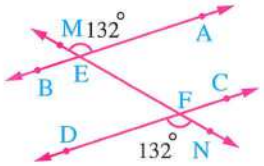
1



2



3



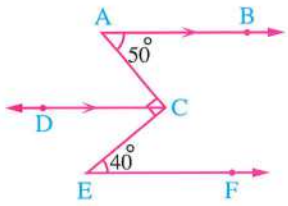
---

15 📖 **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD}$, m (∠ A) = 50° ,

∠ ACE is right and m (∠ E) = 40°

Prove that : $\overrightarrow{AB} // \overrightarrow{EF}$

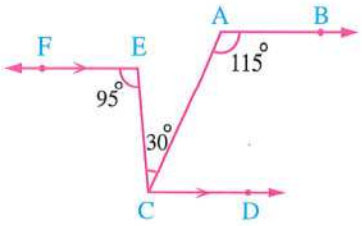


16 **In the opposite figure :**

$\overrightarrow{EF} // \overrightarrow{CD}$, m ($\angle$ CEF) = 95° ,

m ($\angle$ ACE) = 30° , m ($\angle$ BAC) = 115°

Prove that : $\overrightarrow{AB} // \overrightarrow{EF}$



17 **In the opposite figure :**

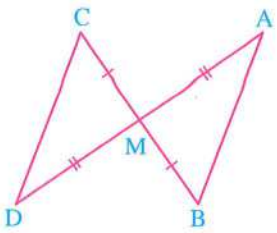
$\overline{AD} \cap \overline{BC} = \{M\}$,

MA = MD and MB = MC

Prove that :

1 AB = CD

2 $\overline{AB} // \overline{CD}$



18 **Prove that :**

1 A straight line which is perpendicular to one of two parallel lines in the same plane is also perpendicular to the other.

2 A straight line that is parallel to one of two parallel lines is also parallel to the other.

19 **In the opposite figure :**

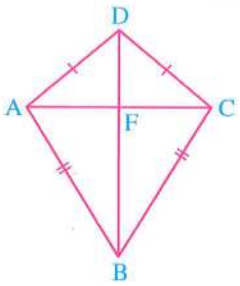
AD = CD and AB = BC

Use the properties of congruent triangles

to show that :

1 $\overrightarrow{DB}$ bisects $\angle$ ADC

2 $\overline{AC}$ and $\overline{DB}$ are perpendicular to each other.



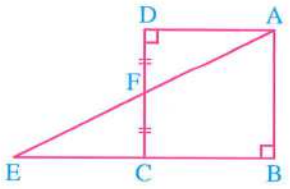
20 **In the opposite figure :**

ABCD is a square in which F

is the midpoint of $\overline{CD}$

and $\overrightarrow{AF} \cap \overrightarrow{BC} = \{E\}$

Prove that : CE = CB



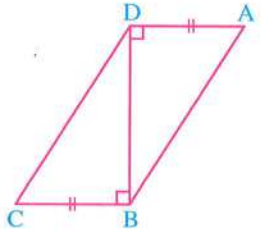
21 **In the opposite figure :**

AD = BC and m ($\angle$ ADB) = m ($\angle$ DBC) = 90°

Prove that :

1 AB = CD

2 $\overline{AB} // \overline{CD}$

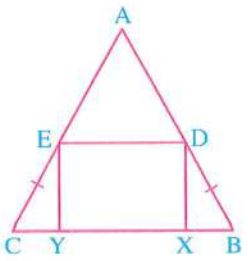


22 **In the opposite figure :**

EC = DB and

DXYE is a rectangle.

Prove that : m (∠ ADE) = m (∠ AED)



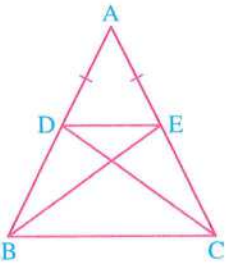
23 **In the opposite figure :**

AD = AE and

m (∠ ADC) = m (∠ AEB)

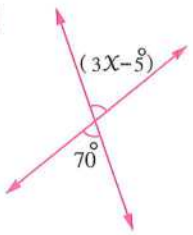
Show that :

1 BE = CD 2 BD = CE

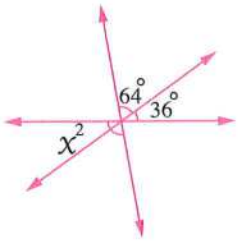


24 **Find the values of x and y in each of the following :**

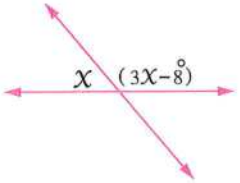
1



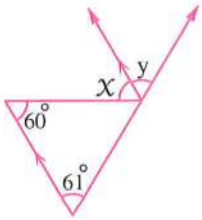
2



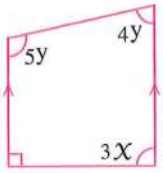
3



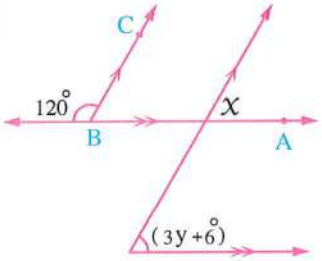
4



5



6



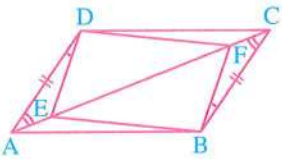
For excellent pupils

25 **In the opposite figure :**

1 Is Δ ADE congruent to Δ CBF ? Give your reason (s).

2 **Prove that :**

First : Δ DEF ≡ Δ BFE **Second :** Δ ABE ≡ Δ CDF

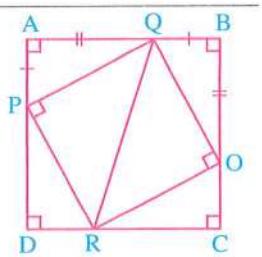


26 **In the opposite figure :**

1 Is Δ PAQ congruent to Δ QBO ? Give your reason (s).

2 **Show that :**

First : Δ PQR ≡ Δ OQR **Second :** Δ PDR ≡ Δ RCO



EXERCISE 2

The polygon

Interactive test

From the school book



Remember Understand Apply Problem Solving

1 Complete the following :

1. The regular polygon is the one in which :
   (a) ..... (b) .....
2. The sum of measures of the interior angles of the quadrilateral = ... °
3. The sum of measures of the interior angles of the pentagon = ... °
4. The sum of measures of the interior angles of the hexagon = ... °
5. The sum of measures of the interior angles of the heptagon = ... °
6. The measure of the interior angle of the regular pentagon = ... °
   and the measure of the interior angle of the regular heptagon = ... °
7. The sum of measures of the exterior angles of the hexagon equals ..... °
8. If the perimeter of a regular hexagon is 30 cm. , then its side length = ... cm.
   and the measure of each interior angle in it = ... °
9. If the perimeter of a regular polygon = 80 cm. and its side length = 10 cm. ,
   then the measure of each interior angle in it = ... °

2 Choose the correct answer from those given :

1. The sum of measures of the interior angles of a polygon of n sides equals .....
   (a) $n \times 180°$ (b) $(n - 2) \times 180°$ (c) $\frac{(n-2) \times 180°}{2}$ (d) $\frac{(n-2) \times 180°}{2n}$
2. The measure of the interior angle of a regular polygon of n sides equals .....
   (a) $\frac{(n-2) \times 90°}{n}$ (b) $\frac{(n-2) \times 180°}{2}$ (c) $\frac{(n-2) \times 180°}{n}$ (d) $180° \times (n - 1)$
3. The measure of the interior angle of the regular polygon of 10 sides equals .....
   (a) 72° (b) 108° (c) 144° (d) 150°

4 The measure of the interior angle of a regular polygon of 18 sides equals .....

(a) 130° (b) 140° (c) 150° (d) 160°

5 If the measure of an interior angle of a regular polygon is 135° , then the number of its sides is .....

(a) 6 (b) 4 (c) 7 (d) 8

6 The sum of measures of the exterior angles of the triangle equals .....

(a) 90° (b) 180° (c) 360° (d) 720°

7 In the quadrilateral ABCD , if m (∠ A) = 2 m (∠ B) = m (∠ C) = 96° , then m (∠ D) = ...

(a) 96° (b) 48° (c) 120° (d) 144°

3 Find the number of the diagonals of each of the following figures :

1 Triangle.

2 Quadrilateral.

3 Pentagon.

Hint : The number of diagonals of the polygon of n sides = $\frac{n(n-3)}{2}$

4 In each of the following , find the measure of the angle marked by (?) :

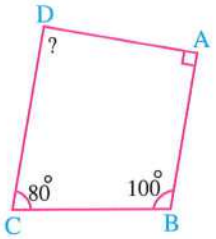


Fig. (1)

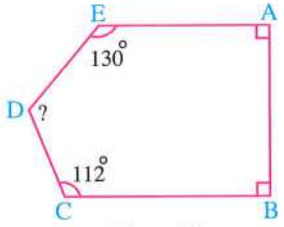


Fig. (2)

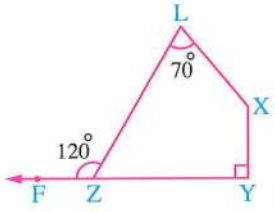
« 90° , 118° »

5 In the opposite figure :

F ∈ $\overrightarrow{YZ}$, m (∠ L) = 70° ,

m (∠ Y) = 90° and m (∠ LZF) = 120°

Find : m (∠ X)



« 140° »

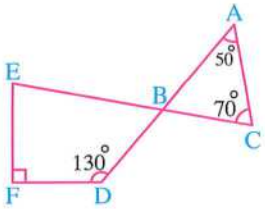
6 In the opposite figure :

$\overline{CE} \cap \overline{AD} = \{B\}$, m (∠ A) = 50°

, m (∠ C) = 70° , m (∠ D) = 130° and

m (∠ F) = 90°

Find : m (∠ E)



« 80° »

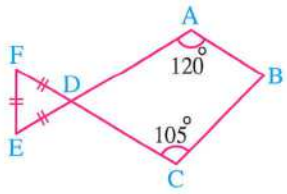
7 **In the opposite figure :**

$\overline{AE} \cap \overline{CF} = \{D\}$,

Δ DEF is an equilateral triangle ,

m ($\angle$ A) = 120° and m ($\angle$ C) = 105°

Find : m ($\angle$ B)



« 75° »

---

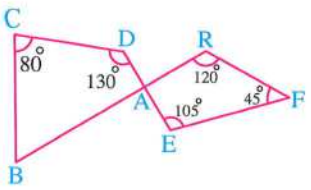
8 **In the opposite figure :**

$\overline{ED} \cap \overline{RB} = \{A\}$, m ($\angle$ F) = 45° ,

m ($\angle$ R) = 120° , m ($\angle$ E) = 105° ,

m ($\angle$ D) = 130° and m ($\angle$ C) = 80°

Find : m ($\angle$ B)



« 60° »

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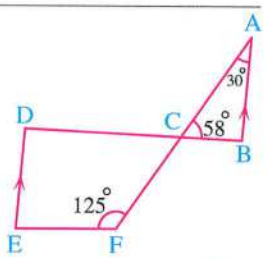
9 **In the opposite figure :**

$\overline{BD} \cap \overline{AF} = \{C\}$, $\overline{AB} \,//\, \overline{ED}$,

m ($\angle$ A) = 30° and m ($\angle$ ACB) = 58° ,

m ($\angle$ CFE) = 125°

Find : m ($\angle$ E)



« 85° »

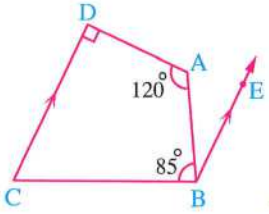
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10 **In the opposite figure :**

m ($\angle$ A) = 120° , m ($\angle$ D) = 90° ,

m ($\angle$ ABC) = 85° and $\overrightarrow{BE} \,//\, \overline{CD}$

Find : m ($\angle$ ABE)



« 30° »

---

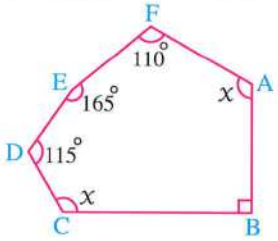
11 **In the opposite figure :**

ABCDEF is a hexagon.

m ($\angle$ A) = m ($\angle$ C)

Find :

The value of x



« 120° »

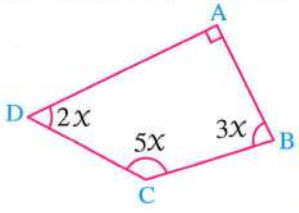
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12 **In the opposite figure :**

ABCD is a quadrilateral

in which : m ($\angle$ A) = 90°

Find : The value of x



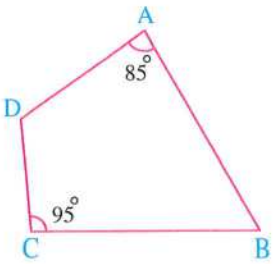
« 27° »

13 **In the opposite figure :**

$m(\angle A) = 85°$, $m(\angle C) = 95°$

and $m(\angle B) = \frac{1}{2} m(\angle D)$

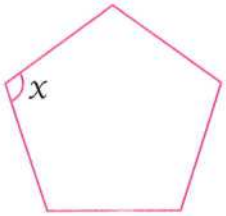
Find the measure of each of them.



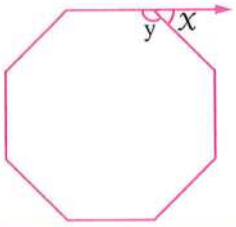
« 60° , 120° »

14 **In each of the following , if the polygon is regular , find the measures of the unknown angles :**

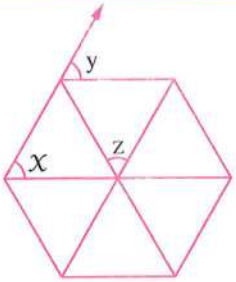
1



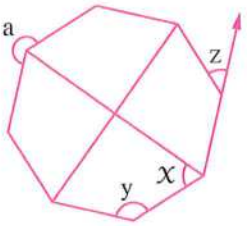
2



3

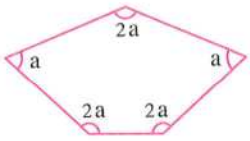


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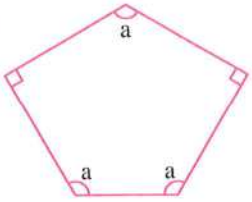


15 **In each of the following , find the values of the unknown symbols :**

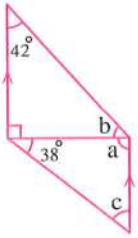
1



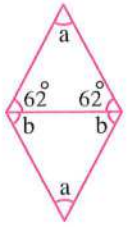
2



3



4

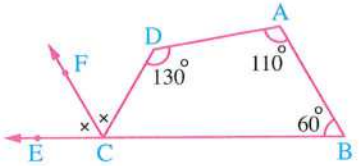


16 **In the opposite figure :**

$m(\angle A) = 110°$, $m(\angle B) = 60°$,

$m(\angle D) = 130°$, $\overrightarrow{CF}$ bisects $\angle DCE$ and $C \in \overrightarrow{BE}$

Prove that : $\overrightarrow{CF} // \overline{AB}$

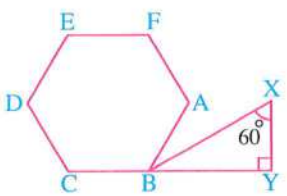


17 **In the opposite figure :**

ABCDEF is a regular hexagon ,

$Y \in \overrightarrow{CB}$, $\overline{XY} \perp \overline{YB}$ and $m(\angle X) = 60°$

Prove that : $\overrightarrow{BX}$ bisects $\angle ABY$



18 If the ratio among the measures of the angles of a pentagon is 3 : 3 : 2 : 3 : 4 , find the greatest measure of the angles of this pentagon. « 144° »

19 If the measure of the exterior angle of a regular polygon is 30° , how many sides does it have ? What is the sum of the measures of its interior angles ? « 12 , 1800° »

20 Is it possible that a regular polygon has an interior angle of measure 100° ? Why ?

21 A polygon of 9 sides. The sum of measures of eight angles of it is 1140°

1 Find the measure of the remained angle. « 120° »

2 Is it possible that this polygon is regular ? Explain your answer.

22 A polygon has 15 sides :

1 Calculate the sum of the measures of its interior angles. « 2340° »

2 If the sum of the measures of five of its exterior angles is 200° , calculate the sum of the measures of the ten interior angles which are not adjacent to the five exterior angles. « 1640° »

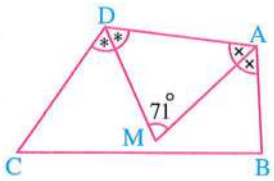
For excellent pupils

23 **In the opposite figure :**

$\overrightarrow{AM}$ bisects ∠ BAD , $\overrightarrow{DM}$ bisects ∠ ADC and

m (∠ AMD) = 71°

Prove that : m (∠ B) + m (∠ C) = 142°

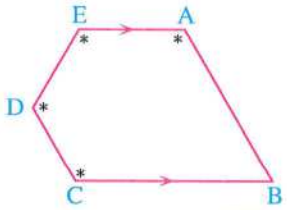


24 **In the opposite figure :**

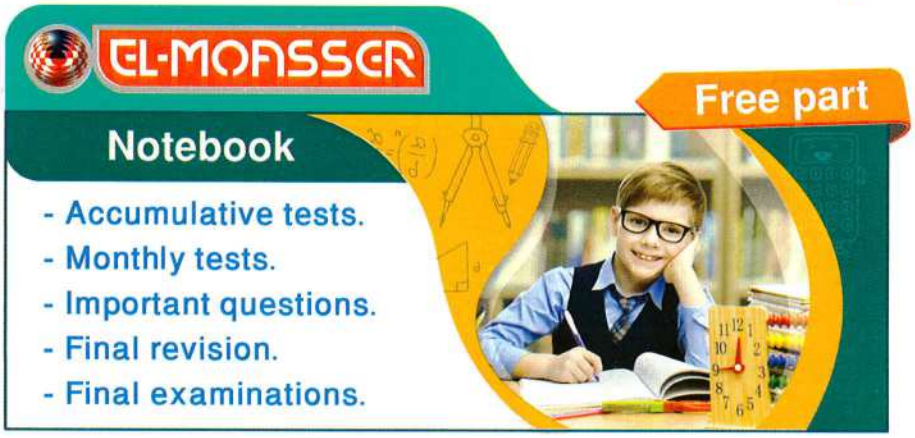
$\overline{AE}$ // $\overline{BC}$,

m (∠ A) = m (∠ E) = m (∠ D) = m (∠ C)

Find : m (∠ B)



« 60° »



Accumulative test 1 on lesson 1 – unit 3

1 **[a] Choose the correct answer from those given :**

1 The sum of the measures of the accumulative angles at a point is equal to .....

(a) 90° (b) 180° (c) 270° (d) 360°

2 If two straight lines intersect , then each two vertically opposite angles are .....

(a) supplementary (b) complementary

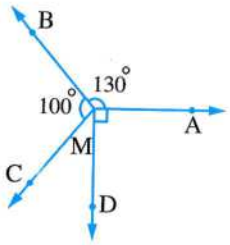
(c) corresponding (d) equal in measure

[b] In the opposite figure :

m (∠ AMB) = 130° , m (∠ BMC) = 100°

, m (∠ AMD) = 90°

Find : m (∠ CMD)



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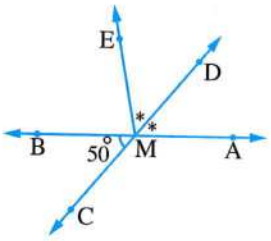
2 **In the opposite figure :**

$\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$

, $\overrightarrow{MD}$ bisects ∠ AME

, m (∠ CMB) = 50°

Find by proof : m (∠ EMB)



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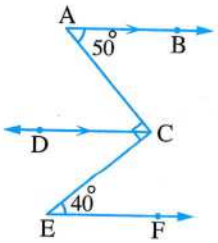
3 **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD}$, m (∠ A) = 50°

, m (∠ ACE) = 90°

, m (∠ E) = 40°

Proof that : $\overrightarrow{CD} // \overrightarrow{EF}$



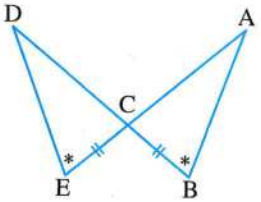
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4 **In the opposite figure :**

$\overline{AE} \cap \overline{BD} = \{C\}$, BC = CE

, m (∠ B) = m (∠ E)

Proof that : AB = DE



Accumulative test 2 till lesson 2 – unit 3

1 Choose the correct answer from those given :

1 The measure of an interior angle of a regular octagon equals .....

(a) 120° (b) 108° (c) 135° (d) 140°

2 The number of diagonals of a regular hexagon equals .....

(a) 6 (b) 9 (c) 12 (d) 10

3 The sum of measures of the interior angles of the hexagon equals .....

(a) 360° (b) 540° (c) 720° (d) 900°

4 The polygon in which the sum of measures of its exterior angles equals the sum of measure of its interior angles is called .....

(a) trianlge. (b) quadrilateral. (c) pentagon. (d) hexagon.

5 The sum of measures of the exterior angles of any convex polygon equals .....

(a) 720° (b) 360° (c) 180° (d) 270°

6 The sum of the measures of the accumulative angles at a point is equal to .....

(a) 180° (b) 90° (c) 360° (d) 270°

7 The concave polygon should have at least ..... angle.

(a) an acute (b) a right (c) an obtuse (d) a reflex

8 The measure of an exterior angle of a regular polygon is 45° , then the number of its sides = ...

(a) 3 (b) 6 (c) 8 (d) 9

---

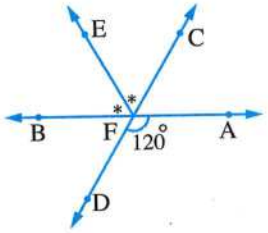
2 In the opposite figure :

$m(\angle CFE) = m(\angle EFB)$

, $m(\angle AFD) = 120°$

, $\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{F\}$

Find : $m(\angle CFE)$



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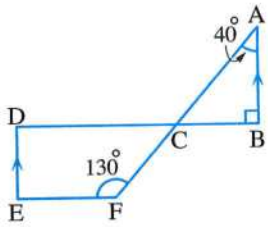
3 In the opposite figure :

$\overline{BD} \cap \overline{AF} = \{C\}$, $\overline{AB} // \overline{DE}$

, $m(\angle A) = 40°$, $m(\angle B) = 90°$

, $m(\angle F) = 130°$

Find by proof : $m(\angle E)$



Prep [1] - Second Term - Algebra - Unit [1] : Numbers and Algebra

Lesson [1] : Repeated Multiplication

Generally

If $\frac{a}{b}$ is a rational number and n is a positive integer , then:

$\left(\frac{a}{b}\right)^n = \frac{a}{b} \times \frac{a}{b} \times \frac{a}{b}$ ... to n times

It is read as « $\frac{a}{b}$ to the power n » or «the n^{th} power of the number $\frac{a}{b}$ »

i.e. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

For example: • $\left(\frac{2}{5}\right)^3 = \frac{2^3}{5^3} = \frac{8}{125}$ • $(0.7)^2 = \left(\frac{7}{10}\right)^2 = \frac{7^2}{10^2} = \frac{49}{100}$

Remark

If $\frac{a}{b}$ is a rational number , then $\left(\frac{a}{b}\right)^0 = 1$ where $a \neq 0$

For example: • $\left(\frac{1}{5}\right)^0 = 1$ • $\left(-\frac{3}{7}\right)^0 = 1$

Remark

If a is a rational number and m is a positive integer , then :

$(-a)^m = (a)^m$ when m is an even number.

For example:

$\left(-\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$

$(-a)^m = -(a)^m$ when m is an odd number.

For example:

$\left(-\frac{1}{2}\right)^3 = -\left(\frac{1}{2}\right)^3 = -\frac{1}{8}$

Lesson [2] : None Negative Integer Powers

The first law

Generally

If $\frac{a}{b}$ is a rational number , n and m are non-negative integers ,

then $\left(\frac{a}{b}\right)^n \times \left(\frac{a}{b}\right)^m = \left(\frac{a}{b}\right)^{n+m}$

i.e.

When multiplying the like bases , we add their powers (indices).

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For example:

- $(\frac{2}{5})^3 \times (\frac{2}{5})^2 = (\frac{2}{5})^{3+2} = (\frac{2}{5})^5$
- $(-\frac{1}{2})^4 \times (-\frac{1}{2})^3 = (-\frac{1}{2})^{4+3} = (-\frac{1}{2})^7$

The second law

According to the first law , you know that : $a^6 = a^2 \times a^4$

, therefore : $a^6 \div a^2 = a^4$, $a^6 \div a^4 = a^2$

Generally

If $\frac{a}{b}$ is a rational number , where $\frac{a}{b} \neq 0$, n and m are non-negative integers , $n \geq m$,

then $(\frac{a}{b})^n \div (\frac{a}{b})^m = (\frac{a}{b})^{n-m}$

i.e.

When dividing like bases , we subtract their powers (indices)

For example:

- $(\frac{3}{8})^5 \div (\frac{3}{8})^2 = (\frac{3}{8})^{5-2} = (\frac{3}{8})^3$
- $(-\frac{2}{7})^4 \div (-\frac{2}{7})^2 = (-\frac{2}{7})^{4-2} = (-\frac{2}{7})^2$

The third law

You know that : $(a^2)^3 = a^2 \times a^2 \times a^2$, and according to the first law : $a^2 \times a^2 \times a^2 = a^6$

i.e. $(a^2)^3 = a^6$

Generally

If $\frac{a}{b}$ is a rational number , n and m are non-negative integers ,

then $[(\frac{a}{b})^n]^m = (\frac{a}{b})^{n \times m}$

For example:

- $[(\frac{3}{5})^3]^2 = (\frac{3}{5})^{3 \times 2} = (\frac{3}{5})^6$
- $[(-\frac{1}{2})^4]^2 = (-\frac{1}{2})^{4 \times 2} = (-\frac{1}{2})^8$

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Exercises

[A] : Choose The Correct Answer :

1	$\left(\frac{4}{7}\right)^0$ = ...			
	(a) 0	(b) 1	(c) $\frac{4}{7}$	(d) – 1
2	$\left(\frac{-2}{3}\right)^2$ = ...			
	(a) $\frac{4}{9}$	(b) $\frac{-4}{9}$	(c) $\frac{4}{6}$	(d) $\frac{-4}{6}$
3	$6 \div 3^0$ = ...			
	(a) 2	(b) 3	(c) 0	(d) 6
4	If $x = y$, then 5^{x-y} = ...			
	(a) 5	(b) 1	(c) 0	(d) – 1
5	If a = b , then $\left(\frac{3}{7}\right)^{b-a}$ equal			
	(a) zero	(b) 1	(c) $\frac{3}{7}$	(d) $\frac{7}{3}$
6	If $x = y$, then $\left(\frac{3}{5}\right)^{x-y}$ = ...			
	(a) 0	(b) 1	(c) $\frac{3}{5}$	(d) $\frac{5}{3}$
7	$2^3 \times 2^5$ = ...			
	(a) 2^2	(b) 2^8	(c) 2^{15}	(d) 2^{53}
8	$2^3 \times 2^3$ = ...			
	(a) 2^6	(b) 2^8	(c) 2^{15}	(d) 2^{53}
9	3×3^2 = ...			
	(a) 9	(b) 3^3	(c) 12	(d) 6
10	$3^5 \times 2^5$ = ...			
	(a) 5^{10}	(b) 6^{10}	(c) 6^5	(d) 6^{25}
11	Half of 2^{10} = ...			
	(a) 2^9	(b) 2^5	(c) 1^{10}	(d) 1^5
12	Half the number 2^{20} = ...			
	(a) 2^{10}	(b) 2^{21}	(c) 2^{19}	(d) 40
13	The half of the number 2^{16} is			
	(a) 2^8	(b) 1^8	(c) 2^6	(d) 2^{15}

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14	Half of 4^{20} = ...				
	(a) 4^{19}	(b) 2^{20}	(c) 4^{39}	(d) 2^{39}	
15	Quarter of 4^{20} equals				
	(a) 4^{5}	(b) 4^{10}	(c) 4^{19}	(d) 1^{20}	
16	Quarter of 4^{2} = ...				
	(a) 16	(b) 2	(c) 1	(d) 4	
17	The additive inverse of the number $(-3)^3$ is				
	(a) 27	(b) – 27	(c) 9	(d) – 9	
18	The multiplicative inverse of $(-1)^2$				
	(a) – 1	(b) – 2	(c) 2	(d) 1	
19	3 + 3 + 3 = ...				
	(a) 3^0	(b) 3^1	(c) 3^2	(d) 3^3	
20	$3^{10} + 3^{10} + 3^{10}$ = ...				
	(a) 3^{10}	(b) 3^{11}	(c) 3^{20}	(d) 3^{30}	
21	$3^5 + 3^5 + 3^5$ = ...				
	(a) 9^5	(b) 9^{15}	(c) 3^{15}	(d) 3^6	
22	$3^x + 3^x + 3^x$ = ...				
	(a) 3^x	(b) 27^x	(c) $3x^3$	(d) 3^{x+1}	
23	$\left(\frac{-5}{6}\right)^2 \div 3\frac{3}{4}$ = ...				
	(a) $\frac{-5}{27}$	(b) $\frac{5}{27}$	(c) $\left(\frac{5}{27}\right)^2$	(d) $\frac{27}{5}$	
24	0.354 × 100 = ...				
	(a) 3.54	(b) 35.4	(c) 354	(d) 3540	
25	$\frac{0.03}{0.01}$ = ...				
	(a) 1	(b) 3	(c) 0.03	(d) 0.3	
26	|– 3| + |5| = ...				
	(a) – 8	(b) – 2	(c) 2	(d) 8	
27	$\frac{9}{20}$ = ... %				
	(a) 9	(b) 18	(c) 27	(d) 45	
28	The prime number is				
	(a) 0	(b) 1	(c) 2	(d) – 2	

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29	Which of the following is the greatest ?				
	(a) 33%	(b) 0.5	(c) $\frac{1}{5}$	(d) 0.25	
30	What is the best estimated of the fraction $\frac{1}{6}$?				
	(a) 15%	(b) 17%	(c) 20%	(d) 25%	
31	The value of 7 in the number 4375 is				
	(a) 0.7	(b) 7	(c) 70	(d) 700	
32	If a = 3 , b = – 2 , then the value of : 3 a b = ...				
	(a) zero	(b) 18	(c) – 18	(d) 4	
33	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, ... (In the same pattern)				
	(a) $\frac{1}{5}$	(b) $\frac{8}{9}$	(c) $\frac{15}{16}$	(d) $\frac{20}{25}$	
34	$\frac{4\,a^2\,b^4}{2\,a^3\,b^3}$ = ...				
	(a) 2 a b	(b) $2\,a^5\,b^7$	(c) $\frac{2\,b}{a}$	(d) $\frac{2}{a\,b}$	

[B] : Complete the Following : -

1	3^{zero} = ...
2	$\left(\frac{-2}{3}\right)^0$ = ...
3	$5\,x^0$ = ...
4	$(x-2)^{zero} = 1$ if $x \neq$ .....
5	The additive inverse of $\left(\frac{\sqrt{2}}{3}\right)^0$ = ...
6	The additive inverse of $(-1)^3$ = ...
7	The additive inverse of $\left(\frac{-2}{3}\right)^0$ is .....
8	The multiplicative inverse of $\left(\frac{-2}{3}\right)^2$ is .....
9	If a = b , then $\left(\frac{3}{11}\right)^{a-b}$ = ...

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10	$\|6\|+\|-6\|=$ .....
11	The multiplicative inverse of 7 = ...
12	If $\frac{x}{y}=\frac{3}{2}$, then $\frac{2x}{5y}=$ ..... = ...
13	If $\frac{x}{y}=\frac{7}{2}$, then $\frac{2x}{7y}=$ .....
14	If $\frac{x}{y}=\frac{3}{2}$, then $\frac{2x}{3y}=$ .....
15	$459.\overline{799} \simeq$ ..... to the nearest tenth
16	If $\frac{P}{2}=4$, $\frac{Q}{3}=1$, then P : Q = ... : .....
17	1 , 1 , 2 , 3 , 5 , 8 , ... , ... (in its same pattern)
18	(1 , 2 , 3 , 5 , 8 , 13 , ... , ... (in the same pattern)
19	3 , 5 , 7 , 9 , ... (in the same pattern)
20	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
21	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, ... , ... (In the same pattern)
22	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
23	The term whose order is 50^{th} in the pattern $\left(\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots\right)$ is .....
24	If a = b , then $7^{b-a}=$ .....
25	If $x = y$, then $5^{x-y}=$ .....
26	$2^2 \times 2 = 2^{\ldots}=$ .....
27	Quarter of 4^{20} equals $4^{\ldots}$ .....

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28	If $\left(\frac{5}{6}\right)^n = \frac{25}{36}$, then n = ...
29	$\left(\frac{2}{7}\right)^5 \div \left(\frac{2}{7}\right)^3$ = ...
30	If $2^x = 3$, then 4^x = ...
31	$\frac{a^2}{b^2} \times \left(\frac{b}{c}\right)^2$ = ... in the simplest form where $b \neq 0$ and $c \neq 0$

[C] : Essay Problems : -

1	**Find the result of :** $\frac{7^2 \times 7}{7 \times 7^3}$ 2016 Exam (10) Question (4) (b)
2	**Simplify** $\frac{x^2 \times x^3}{x^5}$ where $x \neq 0$ 2016 Exam (14) Question (4) (b) (1)
3	**Simplify :** $\frac{7^3 \times 7^3}{(-7)^2}$ 2018 Exam (13) Question (5) (b)
4	**Simplify :** $\frac{5^3 \times (-5)^7}{(-5)^8}$ 2016 Exam (1) Question (3) (a)
5	**Calculate :** $\frac{(-3)^5 \times (-3)^4}{(-3)^7 \times (-3)}$ 2018 Exam (3) Question (4) (a)
6	**Put the following expression in the simplest form :** $\frac{(-x)^4 \times x^7}{(x^2)^3}$ where $x \neq 0$ 2016 Exam (9) Question (5) (b)
7	**Simplify to the simplest form :** $\left(\frac{1}{2}\right)^2 \times \left(\frac{-1}{2}\right)^3$ 2018 Exam (1) Question (3) (a)
8	**Calculate :** $\frac{(5)^2 + (5)^4}{(5)^3}$ 2018 Exam (3) Question (4) (a)

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Homework

[A] : Choose The Correct Answer :

1	$3 \times 3^2 =$ ..... (a) 9 (b) 3^3 (c) 12 (d) 6
2	The multiplicative inverse of $(-1)^2$ ..... (a) -1 (b) -2 (c) 2 (d) 1
3	$\frac{9}{20} =$ ..... % (a) 9 (b) 18 (c) 27 (d) 45
4	$2^3 \times 2^3 =$ ..... (a) 2^6 (b) 2^8 (c) 2^{15} (d) 2^{53}
5	The additive inverse of the number $(-3)^3$ is ..... (a) 27 (b) -27 (c) 9 (d) -9
6	$\lvert -3 \rvert + \lvert 5 \rvert =$ ..... (a) -8 (b) -2 (c) 2 (d) 8
7	$2^3 \times 2^5 =$ ..... (a) 2^2 (b) 2^8 (c) 2^{15} (d) 2^{53}
8	Quarter of $4^2 =$ ..... (a) 16 (b) 2 (c) 1 (d) 4
9	$\frac{0.03}{0.01} =$ ..... (a) 1 (b) 3 (c) 0.03 (d) 0.3
10	$\frac{4\,a^2\,b^4}{2\,a^3\,b^3} =$ ..... (a) 2 a b (b) $2\,a^3\,b^7$ (c) $\frac{2\,b}{a}$ (d) $\frac{2}{a\,b}$
11	$\left(\frac{4}{7}\right)^0 =$ ..... (a) 0 (b) 1 (c) $\frac{4}{7}$ (d) -1
12	If $x = y$, then $\left(\frac{3}{5}\right)^{x-y} =$ ..... (a) 0 (b) 1 (c) $\frac{3}{5}$ (d) $\frac{5}{3}$
13	Quarter of 4^{20} equals ..... (a) 4^5 (b) 4^{10} (c) 4^{19} (d) 1^{20}

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14 $0.354 \times 100 =$ .....

(a) 3.54 (b) 35.4 (c) 354 (d) 3540

15 $\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, ... (In the same pattern)

(a) $\frac{1}{5}$ (b) $\frac{8}{9}$ (c) $\frac{15}{16}$ (d) $\frac{20}{25}$

16 If a = b , then $\left(\frac{3}{7}\right)^{b-a}$ equal .....

(a) zero (b) 1 (c) $\frac{3}{7}$ (d) $\frac{7}{3}$

17 Half of 4^{20} = ...

(a) 4^{19} (b) 2^{20} (c) 4^{39} (d) 2^{39}

18 $\left(\frac{-5}{6}\right)^2 \div 3\frac{3}{4}$ = ...

(a) $\frac{-5}{27}$ (b) $\frac{5}{27}$ (c) $\left(\frac{5}{27}\right)^2$ (d) $\frac{27}{5}$

19 If a = 3 , b = – 2 , then the value of : 3 a b = ...

(a) zero (b) 18 (c) – 18 (d) 4

20 If $x = y$, then 5^{x-y} = ...

(a) 5 (b) 1 (c) 0 (d) – 1

21 The half of the number 2^{16} is .....

(a) 2^8 (b) 1^8 (c) 2^6 (d) 2^{15}

22 $3^x + 3^x + 3^x$ = ...

(a) 3^x (b) 27^x (c) $3x^3$ (d) 3^{x+1}

23 The value of 7 in the number 4375 is .....

(a) 0.7 (b) 7 (c) 70 (d) 700

24 $6 \div 3^0$ = ...

(a) 2 (b) 3 (c) 0 (d) 6

25 Half the number 2^{20} = ...

(a) 2^{10} (b) 2^{21} (c) 2^{19} (d) 40

26 $3^5 + 3^5 + 3^5$ = ...

(a) 9^5 (b) 9^{15} (c) 3^{15} (d) 3^6

27 What is the best estimated of the fraction $\frac{1}{6}$?

(a) 15% (b) 17% (c) 20% (d) 25%

28 $\left(\frac{-2}{3}\right)^2$ = ...

(a) $\frac{4}{9}$ (b) $\frac{-4}{9}$ (c) $\frac{4}{6}$ (d) $\frac{-4}{6}$

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29	Half of 2^{10} = ...				
	(a) 2^9	(b) 2^5	(c) 1^{10}	(d) 1^5	
30	$3^{10} + 3^{10} + 3^{10}$ = ...				
	(a) 3^{10}	(b) 3^{11}	(c) 3^{20}	(d) 3^{30}	
31	Which of the following is the greatest ?				
	(a) 33%	(b) 0.5	(c) $\frac{1}{5}$	(d) 0.25	
32	$3^5 \times 2^5$ = ...				
	(a) 5^{10}	(b) 6^{10}	(c) 6^5	(d) 6^{25}	
33	3 + 3 + 3 = ...				
	(a) 3^0	(b) 3^1	(c) 3^2	(d) 3^3	
34	The prime number is				
	(a) 0	(b) 1	(c) 2	(d) – 2	

[B] : Complete the Following : -

1	If a = b , then $\left(\frac{3}{11}\right)^{a-b}$ = ...
2	(1 , 2 , 3 , 5 , 8 , 13 , ... , ... (in the same pattern)
3	Quarter of 4^{20} equals $4^{.....}$
4	The multiplicative inverse of $\left(\frac{-2}{3}\right)^2$ is .....
5	1 , 1 , 2 , 3 , 5 , 8 , ... , ... (in its same pattern)
6	$2^2 \times 2 = 2^{.....}$ = ...
7	The additive inverse of $\left(\frac{-2}{3}\right)^0$ is .....
8	If $\frac{P}{2} = 4$, $\frac{Q}{3} = 1$, then P : Q = ... : .....
9	If $x = y$, then 5^{x-y} = ...
10	The additive inverse of $(-1)^3$ = ...
11	459.799 ≃ ..... to the nearest tenth

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12	If $a = b$, then $7^{b-a} =$ .....
13	The additive inverse of $\left(\frac{\sqrt{2}}{3}\right)^0 =$ .....
14	If $\frac{x}{y} = \frac{3}{2}$, then $\frac{2x}{3y} =$ .....
15	The term whose order is 50^{th} in the pattern $\left(\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots\right)$ is .....
16	$(x-2)^{zero} = 1$ if $x \neq$ .....
17	If $\frac{x}{y} = \frac{7}{2}$, then $\frac{2x}{7y} =$ .....
18	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
19	$\frac{a^2}{b^2} \times \left(\frac{b}{c}\right)^2 =$ ..... in the simplest form where $b \neq 0$ and $c \neq 0$
20	$3^{zero} =$ .....
21	$5x^0 =$ .....
22	If $\frac{x}{y} = \frac{3}{2}$, then $\frac{2x}{5y} =$ ..... = ...
23	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, ... , ... (In the same pattern)
24	If $2^x = 3$, then $4^x =$ .....
25	$\left(\frac{-2}{3}\right)^0 =$ .....
26	The multiplicative inverse of 7 = ...
27	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
28	$\left(\frac{2}{7}\right)^5 \div \left(\frac{2}{7}\right)^3 =$ .....

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29	$\|6\|+\|-6\|=$ .....
30	3 , 5 , 7 , 9 , ... (in the same pattern)
31	If $\left(\frac{5}{6}\right)^n = \frac{25}{36}$, then n = ...

[C] : Essay Problems : -

1	**Calculate :** $\frac{(5)^2+(5)^4}{(5)^3}$ 2018 Exam (3) Question (4) (a)
2	**Simplify to the simplest form :** $\left(\frac{1}{2}\right)^2 \times \left(\frac{-1}{2}\right)^3$ 2018 Exam (1) Question (3) (a)
3	**Put the following expression in the simplest form :** $\frac{(-x)^4 \times x^7}{(x^2)^3}$ where $x \neq 0$ 2016 Exam (9) Question (5) (b)
4	**Calculate :** $\frac{(-3)^5 \times (-3)^4}{(-3)^7 \times (-3)}$ 2018 Exam (3) Question (4) (a)
5	**Simplify :** $\frac{5^3 \times (-5)^7}{(-5)^8}$ 2016 Exam (1) Question (3) (a)
6	**Find the result of :** $\frac{7^2 \times 7}{7 \times 7^3}$ 2016 Exam (10) Question (4) (b)
7	**Simplify :** $\frac{7^3 \times 7^3}{(-7)^2}$ 2018 Exam (13) Question (5) (b)
8	**Simplify** $\frac{x^2 \times x^3}{x^5}$ where $x \neq 0$ 2016 Exam (14) Question (4) (b) (1)

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Lesson [3] : Negative Integer Powers

Definition :

If a is a rational number , $a \neq 0$ and n is a positive integer ,

then $\boxed{a^{-n} = \frac{1}{a^n}}$ and $\boxed{a^n = \frac{1}{a^{-n}}}$

For example:

- $3^{-3} = \frac{1}{3^3} = \frac{1}{27}$
- $3 \times 5^{-1} = 3 \times \frac{1}{5} = \frac{3}{5}$
- $\frac{2}{5^{-2}} = 2 \times 5^2 = 2 \times 25 = 50$
- $0.1 = \frac{1}{10} = 10^{-1}$, $0.01 = \frac{1}{100} = \frac{1}{10^2} = 10^{-2}$, ... and so on.

Remarks

1 If a is a rational number , $a \neq 0$ and n is a positive integer ,

then $a^n \times a^{-n} = a^n \times \frac{1}{a^n} = 1$ (the multiplicative neutral)

i.e. each of a^n and a^{-n} is the multiplicative inverse of the other

2 If $\frac{a}{b}$ is a rational number not equal to zero and n is a positive integer ,

then $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

For example: $\left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

Remark

All laws of powers that we have studied in the previous lesson are correct in the case of the negative powers. So , the previous example can be solved by using laws of powers as follows :

1 $2^4 \times 2^{-2} = 2^{4+(-2)} = 2^2 = 4$

2 $\frac{5^{-2}}{5^{-3}} = 5^{-2-(-3)} = 5^{-2+3} = 5$

3 $(3^2)^{-2} = 3^{2 \times (-2)} = 3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

4 $\frac{6^{-3} \times 6^5}{6^2} = 6^{-3+5-2} = 6^0 = 1$

5 $\left(\frac{5^3 \times 5^{-2}}{5^{-1} \times 5^4}\right)^{-2} = \left(5^{3+(-2)-(-1)-4}\right)^{-2} = \left(5^{3-2+1-4}\right)^{-2}$

$= \left(5^{-2}\right)^{-2} = 5^{(-2) \times (-2)} = 5^4 = 625$

6 $(7^3)^2 \times (7^{-2})^2 = (7^3 \times 7^{-2})^2$

$= \left(7^{3+(-2)}\right)^2 = 7^2 = 49$

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Exercises

[A] : Choose The Correct Answer : -

1	$(4)^{-1}$ = ...				
	(a) $-\frac{1}{4}$	(b) $\frac{1}{4}$	(c) 4	(d) -4	
2	3×3^2 = ...				
	(a) 9	(b) 3^3	(c) 12	(d) 6	
3	$\frac{4\,a^2\,b^4}{2\,a^3\,b^3}$ = ...				
	(a) 2 a b	(b) $2\,a^5\,b^7$	(c) $\frac{2\,b}{a}$	(d) $\frac{2}{a\,b}$	
4	If a = 3 , b = – 2 , then the value of : 3 a b = ...				
	(a) zero	(b) 18	(c) – 18	(d) 4	
5	$\left(\frac{-2}{3}\right)^2$ = ...				
	(a) $\frac{4}{9}$	(b) $\frac{-4}{9}$	(c) $\frac{4}{6}$	(d) $\frac{-4}{6}$	
6	If $x = \frac{1}{2}$ and $y = \frac{-1}{4}$, then $(x-y)^{-1}$ = ...				
	(a) $\frac{1}{2}$	(b) 2	(c) 4	(d) $\frac{4}{3}$	
7	$\frac{0.03}{0.01}$ = ...				
	(a) 1	(b) 3	(c) 0.03	(d) 0.3	
8	$\left(\frac{-5}{6}\right)^2 \div 3\frac{3}{4}$ = ...				
	(a) $\frac{-5}{27}$	(b) $\frac{5}{27}$	(c) $\left(\frac{5}{27}\right)^2$	(d) $\frac{27}{5}$	
9	What is the best estimated of the fraction $\frac{1}{6}$?				
	(a) 15%	(b) 17%	(c) 20%	(d) 25%	
10	$2^7 \times 2^{-3}$ = ...				
	(a) 2^{10}	(b) 2^4	(c) 2^{-4}	(d) 8	
11	Quarter of 4^2 = ...				
	(a) 16	(b) 2	(c) 1	(d) 4	
12	Half of 4^{20} = ...				
	(a) 4^{19}	(b) 2^{20}	(c) 4^{39}	(d) 2^{39}	
13	$3^5 + 3^5 + 3^5$ = ...				
	(a) 9^5	(b) 9^{15}	(c) 3^{15}	(d) 3^6	

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14	If $a^{x} = 4$ and $a^{-y} = 2$, then a^{x+y} = ...			
	(a) $\frac{1}{2}$	(b) 8	(c) 4	(d) 2
15	$(3^{-2})^{-2}$ = ...			
	(a) 3^{4}	(b) 3^{-4}	(c) 3^{2}	(d) 3^{-2}
16	$2^{3} \times 2^{5}$ = ...			
	(a) 2^{2}	(b) 2^{8}	(c) 2^{15}	(d) 2^{53}
17	If a = b , then $\left(\frac{3}{7}\right)^{b-a}$ equal			
	(a) zero	(b) 1	(c) $\frac{3}{7}$	(d) $\frac{7}{3}$
18	Half the number 2^{20} = ...			
	(a) 2^{10}	(b) 2^{21}	(c) 2^{19}	(d) 40
19	The prime number is			
	(a) 0	(b) 1	(c) 2	(d) – 2
20	$\left(\frac{-2}{3}\right)^{-3}$ equals			
	(a) $\frac{-27}{8}$	(b) $\frac{-8}{27}$	(c) $\frac{8}{27}$	(d) $\frac{27}{8}$
21	$\lvert -3 \rvert + \lvert 5 \rvert$ = ...			
	(a) – 8	(b) – 2	(c) 2	(d) 8
22	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, ... (In the same pattern)			
	(a) $\frac{1}{5}$	(b) $\frac{8}{9}$	(c) $\frac{15}{16}$	(d) $\frac{20}{25}$
23	$6 \div 3^{0}$ = ...			
	(a) 2	(b) 3	(c) 0	(d) 6
24	3 + 3 + 3 = ...			
	(a) 3^{0}	(b) 3^{1}	(c) 3^{2}	(d) 3^{3}
25	$\left(\frac{2}{3}\right)^{-2}$ = ...			
	(a) $\frac{4}{9}$	(b) $\frac{9}{4}$	(c) $\frac{-2}{3}$	(d) $\frac{-3}{2}$
26	The additive inverse of the number $(-3)^{3}$ is			
	(a) 27	(b) – 27	(c) 9	(d) – 9
27	0.354 × 100 = ...			
	(a) 3.54	(b) 35.4	(c) 354	(d) 3540
28	The value of 7 in the number 4375 is			
	(a) 0.7	(b) 7	(c) 70	(d) 700

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[B] : Complete the Following : -

1	$\left(\frac{-2}{3}\right)^{-3}$ = ...
2	(1 , 2 , 3 , 5 , 8 , 13 , ... , ... (in the same pattern)
3	$459.799 \simeq$ ..... to the nearest tenth
4	3^{zero} = ...
5	$\|6\| + \|-6\|$ = ...
6	If a = b , then $\left(\frac{3}{11}\right)^{a-b}$ = ...
7	The additive inverse of $(-1)^3$ = ...
8	$\frac{a^2}{b^2} \times \left(\frac{b}{c}\right)^2$ = ... in the simplest form where $b \neq 0$ and $c \neq 0$
9	$\left(\frac{2}{7}\right)^5 \div \left(\frac{2}{7}\right)^3$ = ...
10	If $x = \frac{1}{2}$, $y = \frac{1}{4}$, then $(x + y)^{-1}$ .....
11	If $x = y$, then 5^{x-y} = ...
12	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
13	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
14	The additive inverse for $\left(\frac{2}{-3}\right)^{-3}$ is .....
15	If $\frac{P}{2} = 4$, $\frac{Q}{3} = 1$, then P : Q = ... : .....
16	If $\frac{x}{y} = \frac{7}{2}$, then $\frac{2x}{7y}$ = ...
17	The multiplicative inverse of 7 = ...

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18	The additive inverse of 2^{-1} is .....
19	The additive inverse of $\left(\frac{-2}{3}\right)^0$ is .....
20	$(x-2)^{zero} = 1$ if $x \neq$ .....
21	$\left(\frac{-2}{3}\right)^0 =$ .....
22	$(b^{-1})^{-3} = b^{.....}$
23	$2^{\hat{2}} \times 2 = 2^{.....} =$ .....
24	The term whose order is 50^{th} in the pattern $\left(\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, ...\right)$ is .....
25	If $2^x = 3$, then $4^x =$ .....
26	$\left(\frac{5}{7}\right)^{-3} = \left(\frac{.....}{.....}\right)^3$
27	1 , 1 , 2 , 3 , 5 , 8 , ... , ... (in its same pattern)
28	If $\frac{x}{y} = \frac{3}{2}$, then $\frac{2x}{3y} =$ .....
29	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, ... , ... (In the same pattern)
30	$(3a^2)^{-1} = \frac{1}{.....}$
31	$\left(\frac{1}{5}\right)^{-1} =$ .....
32	The multiplicative inverse of $\left(\frac{-2}{3}\right)^2$ is .....
33	The additive inverse of $\left(\frac{\sqrt{2}}{3}\right)^0 =$ .....

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[C] : Essay Problems : -

1	**Simplify** $(10^2)^3 \times 10^{-6}$ 2016 Exam (14) Question (4) (b) (1)
2	**Simplify :** $\frac{7^{-3} \times 7^6}{7^3}$ 2016 Exam (4) Question (4) (a)
3	**Find the value of the following in simplest form :** $\frac{7^{-2} \times 7^5}{7^6 \times 7^{-3}}$ 2016 Exam (7) Question (3) (a)
4	**Find in the simplest form the value of :** $\frac{5^7 \times 5^{-4}}{5^3}$ 2016 Exam (13) Question (3) (a)
5	**Simplify :** $\frac{(a^{-2})^{-3} \times a^4}{a^{-1} \times a^{11}}$ $(a \neq 0)$ 2016 Exam (3) Question (5) (a)
6	**Find the value of :** $\frac{(5)^{-4} \times (5)^9}{(5)^3}$ in the simplest form. 2016 Exam (6) Question (3) (a)
7	**Evaluate :** $\left(\frac{9^3 \times 9}{9^5}\right)^{-3}$ 2016 Exam (15) Question (4) (b)
8	Find the value of $\frac{5^{-4} \times 5^7}{5^3}$ in the simplest form. Model 2018 Exam (2) Question (3) (b)
9	**Find the value of :** $\left(\frac{7^4 \times 7^{-2}}{7^3}\right)^{-2}$ 2016 Exam (12) Question (4) (a)
10	**Simplify (with steps) :** $\frac{4^5 \times 4^{-7}}{4^{-3} \times 4^2}$ 2016 Exam (5) Question (3) (mm)
11	**Simplify :** $\left(\frac{2^5 \times 3^2}{3^4 \times 2^3}\right)^{-1}$ 2018 Exam (11) Question (5) (b)

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Homework

[A] : Choose The Correct Answer : -

1	$(4)^{-1}$ = ...			
	(a) $-\frac{1}{4}$	(b) $\frac{1}{4}$	(c) 4	(d) -4
2	$3+3+3$ = ...			
	(a) 3^0	(b) 3^1	(c) 3^2	(d) 3^3
3	$3^x+3^x+3^x$ = ...			
	(a) 3^x	(b) 27^x	(c) $3x^3$	(d) 3^{x+1}
4	If $x=y$, then 5^{x-y} = ...			
	(a) 5	(b) 1	(c) 0	(d) -1
5	$6 \div 3^0$ = ...			
	(a) 2	(b) 3	(c) 0	(d) 6
6	Quarter of 4^{20} equals			
	(a) 4^5	(b) 4^{10}	(c) 4^{19}	(d) 1^{20}
7	$\left(\frac{4}{7}\right)^0$ = ...			
	(a) 0	(b) 1	(c) $\frac{4}{7}$	(d) -1
8	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, ... (In the same pattern)			
	(a) $\frac{1}{5}$	(b) $\frac{8}{9}$	(c) $\frac{15}{16}$	(d) $\frac{20}{25}$
9	$2^3 \times 2^3$ = ...			
	(a) 2^6	(b) 2^8	(c) 2^{15}	(d) 2^{53}
10	The multiplicative inverse of $(-1)^2$			
	(a) -1	(b) -2	(c) 2	(d) 1
11	$\left(\frac{-2}{3}\right)^{-3}$ equals			
	(a) $\frac{-27}{8}$	(b) $\frac{-8}{27}$	(c) $\frac{8}{27}$	(d) $\frac{27}{8}$
12	$\left(-\frac{1}{3}\right)^{-1}$ = ...			
	(a) $-\frac{1}{3}$	(b) 3	(c) -3	(d) $\frac{1}{3}$
13	$3^{10}+3^{10}+3^{10}$ = ...			
	(a) 3^{10}	(b) 3^{11}	(c) 3^{20}	(d) 3^{30}

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14	$(3^{-2})^{-2}$ = ...			
	(a) 3^4	(b) 3^{-4}	(c) 3^2	(d) 3^{-2}
15	$3^5 \times 2^5$ = ...			
	(a) 5^{10}	(b) 6^{10}	(c) 6^5	(d) 6^{25}
16	The half of the number 2^{16} is			
	(a) 2^8	(b) 1^8	(c) 2^6	(d) 2^{15}
17	If $a^x = 4$ and $a^{-y} = 2$, then a^{x+y} = ...			
	(a) $\frac{1}{2}$	(b) 8	(c) 4	(d) 2
18	The value of 7 in the number 4375 is			
	(a) 0.7	(b) 7	(c) 70	(d) 700
19	If $x = y$, then $\left(\frac{3}{5}\right)^{x-y}$ = ...			
	(a) 0	(b) 1	(c) $\frac{3}{5}$	(d) $\frac{5}{3}$
20	$2^7 \times 2^{-3}$ = ...			
	(a) 2^{10}	(b) 2^4	(c) 2^{-4}	(d) 8
21	0.354×100 = ...			
	(a) 3.54	(b) 35.4	(c) 354	(d) 3540
22	$\frac{9}{20}$ = ... %			
	(a) 9	(b) 18	(c) 27	(d) 45
23	If $x = \frac{1}{2}$ and $y = \frac{-1}{4}$, then $(x-y)^{-1}$ = ...			
	(a) $\frac{1}{2}$	(b) 2	(c) 4	(d) $\frac{4}{3}$
24	The additive inverse of the number $(-3)^3$ is			
	(a) 27	(b) – 27	(c) 9	(d) – 9
25	$(7)^{-2}$ = ...			
	(a) 49	(b) $\frac{1}{49}$	(c) 14	(d) – 14
26	$\left(\frac{2}{3}\right)^{-2}$ = ...			
	(a) $\frac{4}{9}$	(b) $\frac{9}{4}$	(c) $\frac{-2}{3}$	(d) $\frac{-3}{2}$
27	Which of the following is the greatest ?			
	(a) 33%	(b) 0.5	(c) $\frac{1}{5}$	(d) 0.25
28	Half of 2^{10} = ...			
	(a) 2^9	(b) 2^5	(c) 1^{10}	(d) 1^5

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[B] : Complete the Following : -

1	$\left(\frac{-2}{3}\right)^{-3}$ = ...
2	The additive inverse for $\left(\frac{2}{-3}\right)^{-3}$ is .....
3	$2^{2} \times 2 = 2^{.....}$ = ...
4	The multiplicative inverse of $\left(\frac{-2}{3}\right)^{2}$ is .....
5	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
6	$(b^{-1})^{-3} = b^{.....}$
7	$\left(\frac{1}{5}\right)^{-1}$ = ...
8	$\frac{1}{9}$, $\frac{1}{8}$, $\frac{1}{7}$, ... , ... (In the same pattern).
9	$\left(\frac{-2}{3}\right)^{0}$ = ...
10	$(3\,a^{2})^{-1} = \frac{1}{.....}$
11	3 , 5 , 7 , 9 , ... (in the same pattern)
12	If $x = y$, then 5^{x-y} = ...
13	$(x-2)^{zero} = 1$ if $x \neq$ .....
14	$\frac{1}{2}$, $\frac{3}{4}$, $\frac{7}{8}$, $\frac{15}{16}$, ... , ... (In the same pattern)
15	$5\,x^{0}$ = ...
16	The additive inverse of $\left(\frac{\sqrt{2}}{3}\right)^{0}$ = ...
17	If $x = \frac{1}{2}$, $y = \frac{1}{4}$, then $(x+y)^{-1}$ .....
18	The additive inverse of $\left(\frac{-2}{3}\right)^{0}$ is .....

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19	If $\frac{x}{y} = \frac{3}{2}$, then $\frac{2x}{3y} =$ .....
20	If $a = b$, then $7^{b-a} =$ .....
21	$\left(\frac{2}{7}\right)^5 \div \left(\frac{2}{7}\right)^3 =$ .....
22	The additive inverse of 2^{-1} is .....
23	1 , 1 , 2 , 3 , 5 , 8 , ... , ... (in its same pattern)
24	Quarter of 4^{20} equals $4^{.....}$
25	$\frac{a^2}{b^2} \times \left(\frac{b}{c}\right)^2 =$ ..... in the simplest form where $b \neq 0$ and $c \neq 0$
26	The multiplicative inverse of 7 = ...
27	$\left(\frac{5}{7}\right)^{-3} = \left(\frac{.....}{.....}\right)^3$
28	If $\left(\frac{5}{6}\right)^n = \frac{25}{36}$, then n = ...
29	The additive inverse of $(-1)^3$ = ...
30	If $\frac{x}{y} = \frac{7}{2}$, then $\frac{2x}{7y} =$ .....
31	If $2^x = 3$, then $4^x =$ .....
32	If $\frac{x}{y} = \frac{3}{2}$, then $\frac{2x}{5y} =$ ..... = ...
33	$\left(\frac{-2}{3}\right)^{-3} =$ .....
34	(1 , 2 , 3 , 5 , 8 , 13 , ... , ... (in the same pattern)
35	$459.799 \simeq$ ..... to the nearest tenth
36	$3^{zero} =$ .....
37	The term whose order is 50^{th} in the pattern $\left(\frac{1}{2} , \frac{2}{3} , \frac{3}{4} , \frac{4}{5} , ...\right)$ is .....

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[C] : Essay Problems : -

1	**Simplify :** $\frac{(a^{-2})^{-3} \times a^{4}}{a^{-1} \times a^{11}}$ $(a \neq 0)$ 2016 Exam (3) Question (5) (a)
2	**Simplify to the simplest form :** $\frac{3^{5} \times 3^{-2}}{3^{3}}$ 2018 Exam (6) Question (4) (a)
3	**Find the result of :** $\left(\frac{2^{3} \times 2^{-4}}{2^{-2} \times 2^{5}} \right)^{-1}$ 2016 Exam (2) Question (3) (a)
4	**Find the value of :** $\frac{4 \times 4^{-2}}{4^{-3}}$ in the simplest form 2018 Exam (14) Question (3) (a)
5	**Simplify :** $\left(\frac{2^{5} \times 3^{2}}{3^{4} \times 2^{3}} \right)^{-1}$ 2018 Exam (11) Question (5) (b)
6	**Simplify (with steps) :** $\frac{4^{5} \times 4^{-7}}{4^{-3} \times 4^{2}}$ 2016 Exam (5) Question (3) (mm)
7	**Find the value of :** $\left(\frac{7^{4} \times 7^{-2}}{7^{3}} \right)^{-2}$ 2016 Exam (12) Question (4) (a)
8	Find the value of $\frac{5^{-4} \times 5^{7}}{5^{3}}$ in the simplest form. Model 2018 Exam (2) Question (3) (b)
9	**Find the value of :** $\frac{(5)^{-4} \times (5)^{9}}{(5)^{3}}$ in the simplest form. 2016 Exam (6) Question (3) (a)
10	**Find the value of :** $\frac{7^{4} \times 7^{-2}}{7^{3}}$ 2018 Exam (9) Question (5) (a)

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Prep [1] - Second Term - Unit [3] : Geometry And Measurement

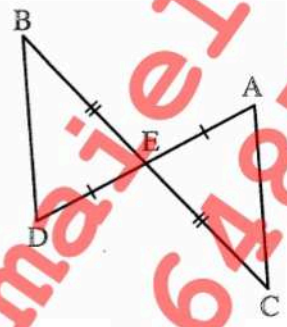
Lesson [1] : Deductive Proof

Example [1]

In the opposite figure :

$\overline{AD} \cap \overline{BC} = \{E\}$ where AE = DE and BE = CE

Prove that : $\Delta AEC \equiv \Delta DEB$



Solutions

Given $\overline{AD} \cap \overline{BC} = \{E\}$ where AE = DE , BE = CE

R.T.P. $\Delta AEC \equiv \Delta DEB$

Proof $\because \overline{AD} \cap \overline{BC} = \{E\}$ $\therefore m(\angle AEC) = m(\angle DEB)$ (V.O.A)

$\therefore$ In $\Delta\Delta$ AEC and DEB :

- AE = DE (given)
- CE = BE (given)
- $m(\angle AEC) = m(\angle DEB)$ (by proof)

$\therefore \Delta AEC \equiv \Delta DEB$ (Q.E.D.)

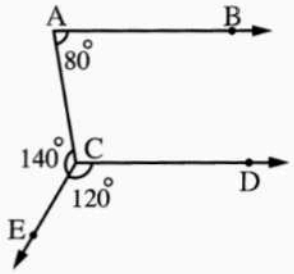
Example [2]

In the opposite figure :

$m(\angle BAC) = 80°$, $m(\angle DCE) = 120°$

and $m(\angle ACE) = 140°$

Prove that : $\overrightarrow{AB} // \overrightarrow{CD}$



Solutions

Given $m(\angle BAC) = 80°$, $m(\angle DCE) = 120°$,

$m(\angle ACE) = 140°$

R.T.P. $\overrightarrow{AB} // \overrightarrow{CD}$

Proof $\because m(\angle DCA) + m(\angle DCE) + m(\angle ACE) = 360°$

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(accumulative angles at C)

$\therefore$ m ($\angle$ DCA) = 360° – (120° + 140°) = 100°

$\therefore$ m ($\angle$ BAC) + m ($\angle$ DCA) = 80° + 100° = 180°

And they are interior angles in the same side of the transversal $\overleftrightarrow{AC}$

$\therefore \overrightarrow{AB} // \overrightarrow{CD}$ (Q.E.D.)

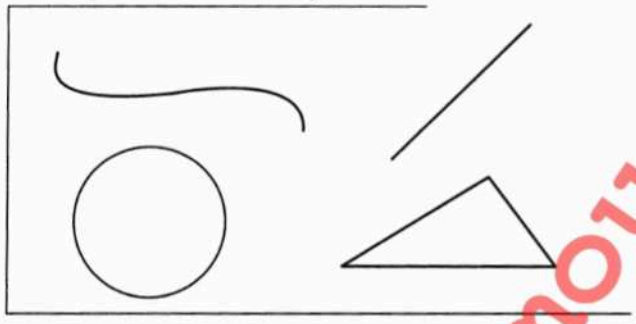
Lesson [2] : Part [1] : The Polygon

Before studying polygons we will study the types of the line as follows.

The simple line

It is the line that does not cut itself.

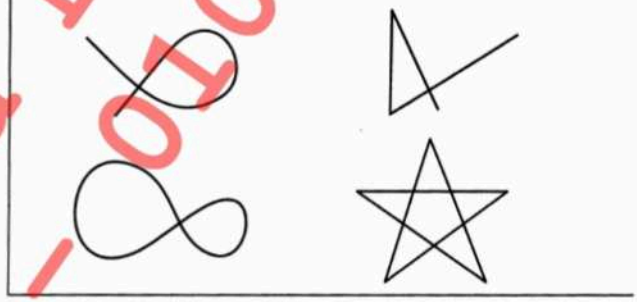
Examples for the simple line :



The non-simple line

It is the line that cuts itself once or more.

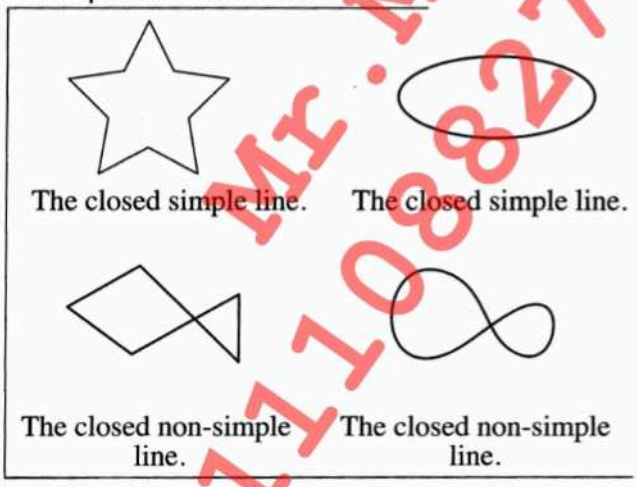
Examples for the non-simple line :



The closed line

It is the line that ends where it starts at the same point. It may be simple or non-simple.

Examples for the closed line :



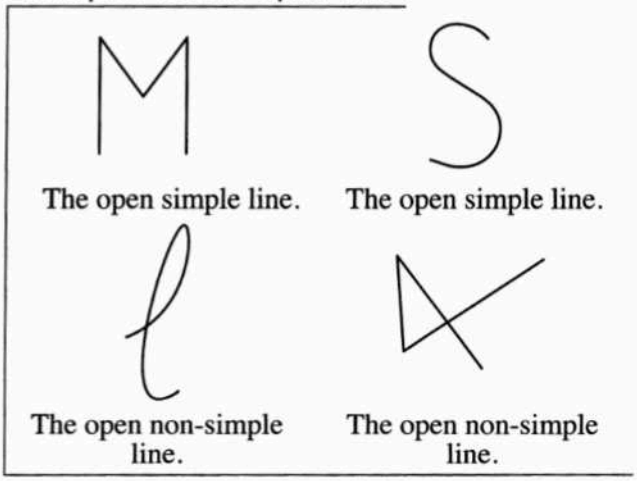
The closed simple line. The closed simple line.

The closed non-simple line. The closed non-simple line.

The open line

It is the line whose starting point is not the end point. It may be simple or non-simple.

Examples for the open line :



The open simple line. The open simple line.

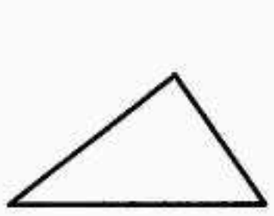
The open non-simple line. The open non-simple line.

The Polygon :

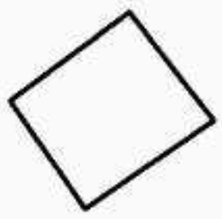
It is a simple closed line that consists of three line segments , or more. The polygon is named according to the number of its sides.

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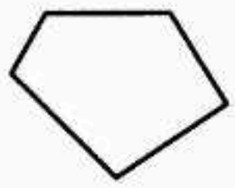
Examples for some polygons :



Triangle
(3 sides)



Quadrilateral
(4 sides)



Pentagon
(5 sides)



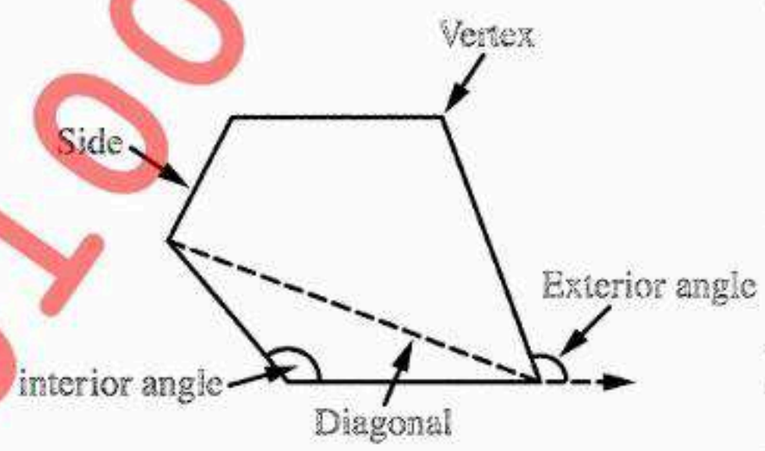
Heptagon
(7 sides)



Octagon
(8 sides)

Remarks

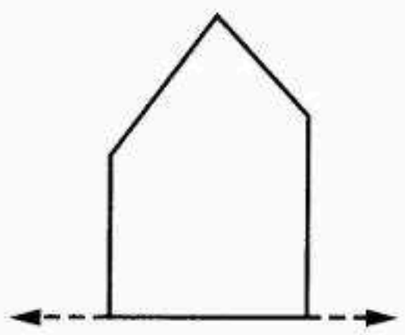
1. Each line segment of the line segments forming the polygon is called a side.
2. Each point resulted from intersecting of two adjacent sides of the polygon is called a vertex.
3. The sum of the side lengths of the polygon is called the perimeter of the polygon.
4. Each line segment joining two non-adjacent vertices of the polygon is called a diagonal of the polygon.
5. The included angle between two adjacent sides of the polygon is called an interior angle.
6. The included angle between a side of the polygon and the extension of its adjacent side is called an exterior angle.

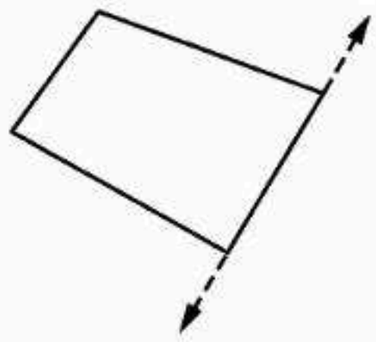


Convex Polygon And Concave Polygon :

In the convex polygon :

If a straight line is drawn to pass through any two consecutive vertices, then the remained vertices lie on one side of this straight line.



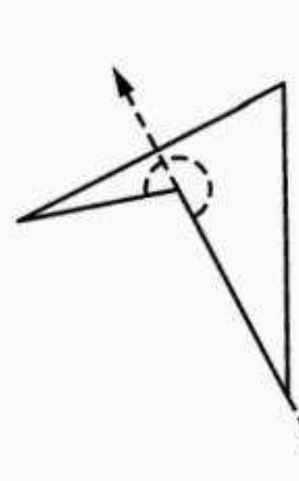


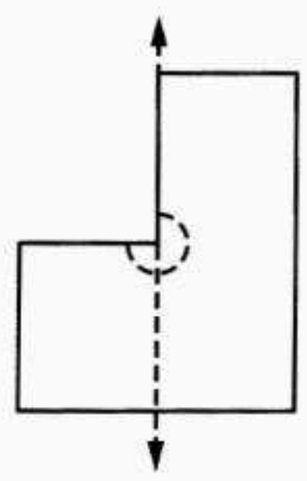
Notice that :

Any interior angle of the convex polygon has measure less than 180°

In the concave polygon :

There are straight lines (one at least) passing through two consecutive vertices and the remained vertices lie on two different sides of the straight line.





Notice that :

There is at least one interior angle of concave polygon of measure more than 180° (reflex angle).

The Sum Of Measures Of The Interior Angles Of The Polygon :

∴ The sum of measures of the interior angles of a polygon of n sides equals $(n - 2) \times 180°$

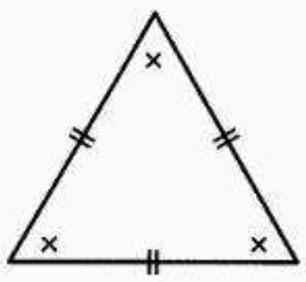
The sum of measures of the exterior angles of a convex polygon of n sides = 360°
(taking into account one exterior angle at each vertex)

The Regular Polygon :

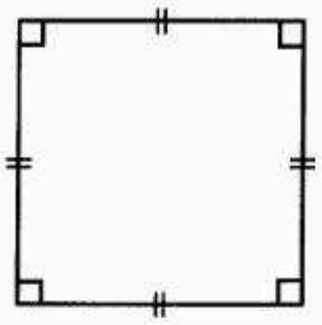
The polygon is regular if :

1. All its sides are equal in length.
2. All its angles are equal in measure.

As examples for the regular polygons :



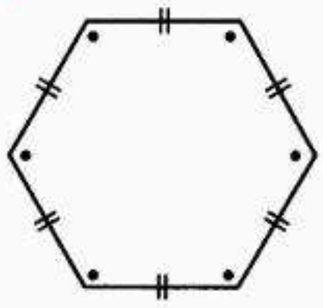
Equilateral triangle



Square



Regular pentagon



Regular hexagon

The Measure Of The Interior Angle Of A Regular Polygon :

∴ The measure of each interior angle of the regular polygon of n-sides $= \frac{(n - 2) \times 180°}{n}$

For example:

- The measure of each interior angle of the equilateral triangle $= \frac{(3 - 2) \times 180°}{3} = 60°$
- The measure of each interior angle of the square $= \frac{(4 - 2) \times 180°}{4} = 90°$
- The measure of each interior angle of the regular pentagon $= \frac{(5 - 2) \times 180°}{5} = 108°$
- The measure of each interior angle of the regular hexagon $= \frac{(6 - 2) \times 180°}{6} = 120°$

Notice that :

The number of the polygon sides = The number of its vertices
= The number of its interior angles = The number of its exterior angles

Remarks

The number of sides of the regular polygon in which the measure of one of its interior angles is $\chi° = \frac{360°}{180° - \chi}$

Number of diagonals = n (n – 3) ÷ 2

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Exercises

[A] : Choose The Correct Answer : -

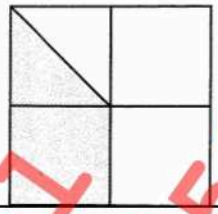
1	The measure of the right angle = ... ° (a) 180 (b) 90 (c) 120 (d) 0
2	The angle whose measure 90° is ..... angle. (a) acute (b) right (c) obtuse (d) straight
3	**The sum of the measures of the accumulative angles at a point = ...** **(a) 90° (b) 180° (c) 270° (d) 360°**
4	If $\Delta ABC \equiv \Delta XYZ$, then AB = ... (a) XY (b) YZ (c) XZ (d) BC
5	The angle with measure 70° complement angle with measure .....° (a) 70 (b) 110 (c) 290 (d) 20
6	The acute angle supplements ..... angle. (a) acute (b) right (c) obtuse (d) straight
7	The area of the circle = ... (a) πr (b) πr^2 (c) $2 \pi r$ (d) $2 \pi r^2$
8	**The two bisectors of two adjacent supplementary angles included an angle of measure .....°** (a) 180 (b) 45 (c) 90 (d) 0
9	The perpendicular to one of two parallel lines is ..... to the other. (a) parallel (b) equal (c) congruent (d) perpendicular
10	The edge length of a cube whose total area is 600 cm^2. is ..... cm. (a) 10 (b) 100 (c) 300 (d) 90
11	The hexagon has ..... sides. (a) 5 (b) 6 (c) 7 (d) 8
12	The pentagon has ..... sides. (a) 3 (b) 4 (c) 5 (d) 6
13	**The sum of the measures of the exterior angles of a polygon of n sides is .....** **(a) (n – 2) (b) (n – 2) × 180° (c) 360° (d) $\frac{(n-2) \times 180°}{n}$**
14	The sum of the measures of the interior angles of a triangle = ...° (a) 90 (b) 360 (c) 180 (d) 540

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15 The sum of the measures of the interior angles of a pentagon is .....

(a) 360° (b) 450° (c) 720° (d) 540°

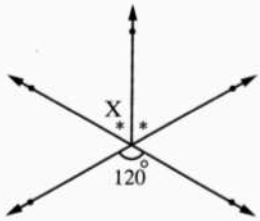
16 The area of the shaded part = ... the total area of the shape.



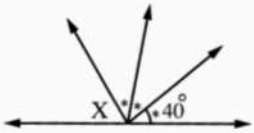
(a) $\frac{1}{8}$ (b) $\frac{1}{4}$

(c) $\frac{3}{8}$ (d) $\frac{3}{4}$

17 In all the following shapes m (∠ X) = 60° except the shape .....



(a)



(b)



(c)



(d)

18 The sum of measures of the exterior angles of the hexagon = ...

(a) 720 ° (b) 120 ° (c) 180 ° (d) 360 °

19 The measure of the exterior angle of the equilateral triangle = ...

(a) 60° (b) 90° (c) 30° (d) 120°

20 If the number of sides of a regular polygon is 5 and if the measure of each interior angle is (x°) , then x = ...

(a) 90° (b) 108° (c) 120° (d) 180°

21 The measure of the interior angle of a regular pentagon = ...

(a) 900° (b) 180° (c) 540° (d) 108°

22 The measure of each angle of the regular hexagon is .....

(a) 90° (b) 180° (c) 120° (d) 144°

23 The measure of the interior angle of a regular polygon of 18 sides equals .....

(a) 130° (b) 140° (c) 150° (d) 160°

24 How many sides has a regular polygon if the measure of each interior angle of it is 120° ?

(a) 5 (b) 6 (c) 7 (d) 8

25 If the measure of an interior angle of a regular polygon is 135° , then the number of its sides is .....

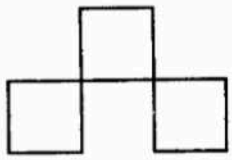
(a) 6 (b) 4 (c) 7 (d) 8

26 The number of diagonals of a quadrilateral is .....

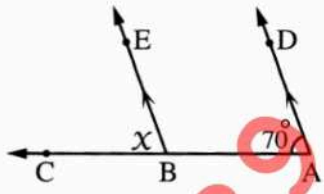
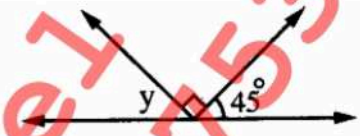
(a) 4 (b) 3 (c) 2 (d) 0

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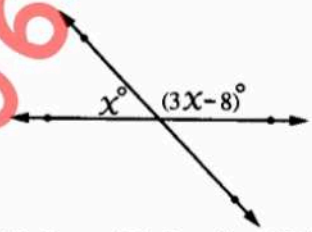
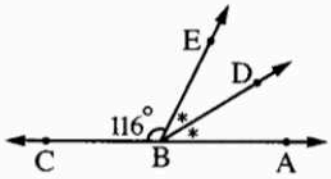
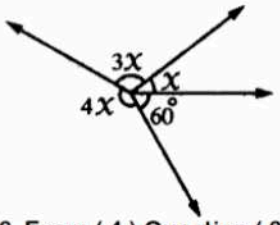
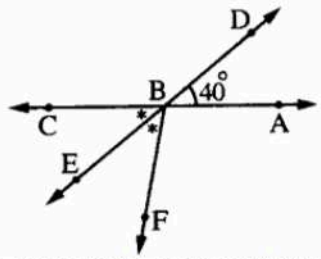
[B] : Complete the Following : -

1	The angle of measure 180° its type is .....
2	The measure of the straight angle equals .....°
3	The measure of the right angle = ...°
4	The sum of the measures of the accumulative angles at a point is .....°
5	The two vertically opposite angles are .....
6	If two straight lines intersect , then the measures of each two vertically opposite angles are .....
7	Every two vertically opposite angles are ..... in measure.
8	Each two opposite angles in a parallelogram are .....
9	If two straight lines intersect , then the sum of measures of any two adjacent angles is .....
10	If a straight line intersects two parallel straight lines , then every two interior angles in the same side of the transversal are .....
11	The opposite figure represents 3 squares each of side length 1 cm. , the perimeter of the figure = ... 
12	A circle its radius length 10 cm. , then its circumference = ... (Consider $\pi = 3.14$)
13	The sum of the measures of the exterior angles of the convex polygon = ...
14	The sum of the measures of the angles of the quadrilateral equals .....
15	The measure of each interior angle of the regular hexagon is .....°
16	The measure of each interior angle of the regular pentagon = ...

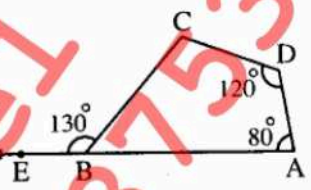
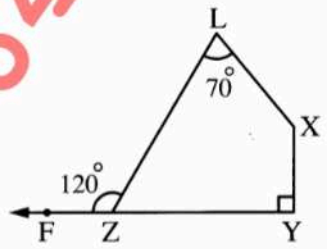
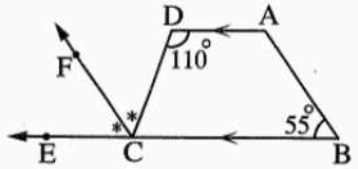
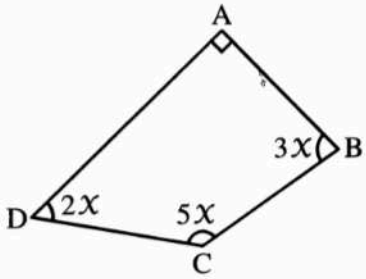
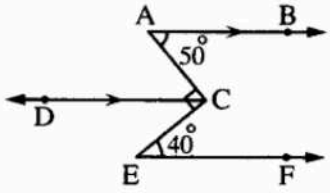
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17	**In the opposite figure :** x = ...° 
18	**In the oppoiste figure :** y = ...° 

[C] : Essay Problems : -

1	**In the opposite figure :** Find the value of x  2016 Exam (3) Question (3) (b)
2	**In the opposite figure :** B $\in \overleftrightarrow{AC}$, m (∠ CBE) = 116° and $\overrightarrow{BD}$ bisect ∠ ABE **Find with proof :** m (∠ ABD)  2016 Exam (12) Question (5) (a)
3	**In the opposite figure :** **Find :** the value of x  2016 Exam (4) Question (3) (b)
4	**In the opposite figure :** **Find :** m (∠ ABF)  2016 Exam (3) Question (4) (b)
5	Find the number of sides of the regular polygon if the measure of its interior angle is 135° 2016 Exam (14) Question (5) (a)
6	Mention two cases of congruency of two triangles.

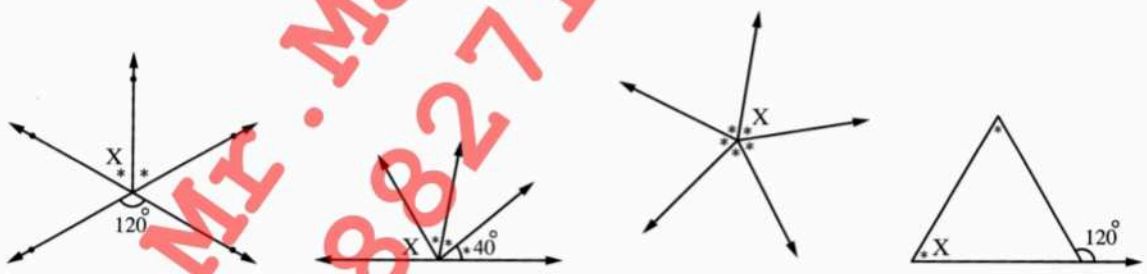
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	2017 Exam (12) Question (5) (a)
7	Using the geometric tools , draw the angle ABC of measure 140 , then bisect it. (don't remove arcs). 2017 Exam (12) Question (4) (b)
8	**In the opposite figure :** m (∠ A) = 80° , m (∠ D) = 120° , m (∠ CBE) = 130° and B ∈ $\overrightarrow{AE}$ **Find with proof :** m (∠ C)  2016 Exam (6) Question (3) (a)
9	**In the opposite figure :** F ∈ $\overrightarrow{YZ}$, m (∠ L) = 70° , m (∠ Y) = 90° and m (∠ LZF) = 120° **Find :** m (∠ X)  2018 Exam (13) Question (3) (b)
10	**In the opposite figure :** $\overline{AD}$ // $\overrightarrow{BC}$, $\overrightarrow{CF}$ bisects ∠ DCE , m (∠ ABC) = 55° , m (∠ ADC) = 110° **Prove that :** $\overline{AB}$ // $\overrightarrow{CF}$  2017 Exam (11) Question (5) (b)
11	**In the opposite figure :** ABCD is a quadrilateral in which : m (∠ A) = 90° **Find :** the value of x  2018 Exam (11) Question (3) (a)
12	**In the opposite figure :** $\overrightarrow{AB}$ // $\overrightarrow{CD}$, m (∠ A) = 50° , ∠ ACE is right angle , and m (∠ E) = 40° **Prove that :** $\overrightarrow{AB}$ // $\overrightarrow{EF}$  2016 Exam (5) Question (5) (b)

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Homework

[A] : Choose The Correct Answer : -

1	The edge length of a cube whose total area is 600 cm^2. is ..... cm. (a) 10 (b) 100 (c) 300 (d) 90
2	If the number of sides of a regular polygon is 5 and if the measure of each interior angle is ($x°$) , then x = ... (a) 90° (b) 108° (c) 120° (d) 180°
3	The perpendicular to one of two parallel lines is ..... to the other. (a) parallel (b) equal (c) congruent (d) perpendicular
4	The measure of the exterior angle of the equilateral triangle = ... (a) 60° (b) 90° (c) 30° (d) 120°
5	The two bisectors of two adjacent supplementary angles included an angle of measure .....° (a) 180 (b) 45 (c) 90 (d) 0
6	The sum of measures of the exterior angles of the hexagon = ... (a) 720 ° (b) 120 ° (c) 180 ° (d) 360 °
7	The area of the circle = ... (a) πr (b) πr^2 (c) $2 \pi r$ (d) $2 \pi r^2$
8	In all the following shapes m (∠ X) = 60° except the shape .....  (a) (b) (c) (d)
9	The number of diagonals of a quadrilateral is ..... (a) 4 (b) 3 (c) 2 (d) 0
10	The angle with measure 70° complement angle with measure .....° (a) 70 (b) 110 (c) 290 (d) 20
11	If the measure of an interior angle of a regular polygon is 135° , then the number of its sides is ..... (a) 6 (b) 4 (c) 7 (d) 8

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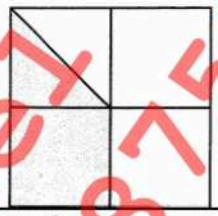
12 If $\Delta ABC \equiv \Delta XYZ$, then AB = ...

(a) XY (b) YZ (c) XZ (d) BC

13 The acute angle supplements ..... angle.

(a) acute (b) right (c) obtuse (d) straight

14 The area of the shaded part = ... the total area of the shape.



(a) $\frac{1}{8}$ (b) $\frac{1}{4}$

(c) $\frac{3}{8}$ (d) $\frac{3}{4}$

15 The sum of the measures of the interior angles of a triangle = ...°

(a) 90 (b) 360 (c) 180 (d) 540

16 How many sides has a regular polygon if the measure of each interior angle of it is 120° ?

(a) 5 (b) 6 (c) 7 (d) 8

17 The sum of the measures of the accumulative angles at a point = ...

(a) 90° (b) 180° (c) 270° (d) 360°

18 The sum of the measures of the exterior angles of a polygon of n sides is .....

(a) (n – 2) (b) (n – 2) × 180° (c) 360° (d) $\frac{(n-2)\times 180°}{n}$

19 The measure of the interior angle of a regular polygon of 18 sides equals .....

(a) 130° (b) 140° (c) 150° (d) 160°

20 The angle whose measure 90° is ..... angle.

(a) acute (b) right (c) obtuse (d) straight

21 The pentagon has ..... sides.

(a) 3 (b) 4 (c) 5 (d) 6

22 The measure of each angle of the regular hexagon is .....

(a) 90° (b) 180° (c) 120° (d) 144°

23 The measure of the right angle = ... °

(a) 180 (b) 90 (c) 120 (d) 0

24 The sum of the measures of the interior angles of a pentagon is .....

(a) 360° (b) 450° (c) 720° (d) 540°

25 The measure of the interior angle of a regular pentagon = ...

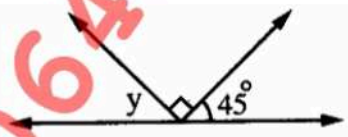
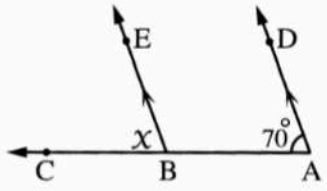
(a) 900° (b) 180° (c) 540° (d) 108°

26 The hexagon has ..... sides.

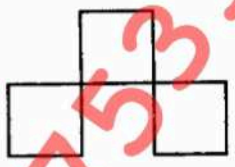
(a) 5 (b) 6 (c) 7 (d) 8

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[B] : Complete the Following : -

1	If a straight line intersects two parallel straight lines , then every two interior angles in the same side of the transversal are .....
2	If two straight lines intersect , then the sum of measures of any two adjacent angles is .....
3	Each two opposite angles in a parallelogram are .....
4	**In the oppoiste figure :** y = ...° 
5	Every two vertically opposite angles are ..... in measure.
6	**In the opposite figure :** x = ...° 
7	If two straight lines intersect , then the measures of each two vertically opposite angles are .....
8	The measure of each interior angle of the regular pentagon = ...
9	The two vertically opposite angles are .....
10	The angle of measure 180° its type is .....
11	The measure of each interior angle of the regular hexagon is .....°
12	The sum of the measures of the accumulative angles at a point is .....°
13	The sum of the measures of the angles of the quadrilateral equals .....
14	The measure of the right angle = ...°
15	The sum of the measures of the exterior angles of the convex polygon = ...

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16	The measure of the straight angle equals ..... °
17	A circle its radius length 10 cm. , then its circumference = ... (Consider $\pi = 3.14$)
18	The opposite figure represents 3 squares each of side length 1 cm. , the perimeter of the figure = ... 

[C] : Essay Problems : -

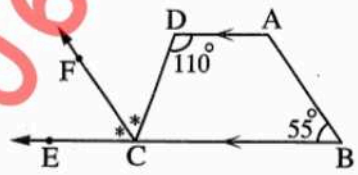
1

In the opposite figure :

$\overline{AD} // \overrightarrow{BC}$, $\overrightarrow{CF}$ bisects $\angle DCE$

, $m(\angle ABC) = 55°$, $m(\angle ADC) = 110°$

Prove that : $\overline{AB} // \overrightarrow{CF}$



2017 Exam (11) Question (5) (b)

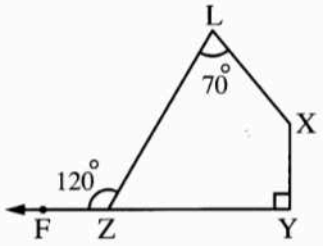
2

In the opposite figure :

$F \in \overrightarrow{YZ}$, $m(\angle L) = 70°$

, $m(\angle Y) = 90°$ and $m(\angle LZF) = 120°$

Find : $m(\angle X)$



2018 Exam (13) Question (3) (b)

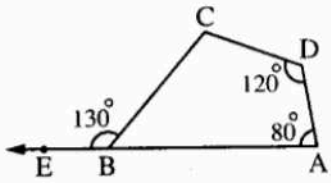
3

In the opposite figure :

$m(\angle A) = 80°$, $m(\angle D) = 120°$,

$m(\angle CBE) = 130°$ and $B \in \overrightarrow{AE}$

Find with proof : $m(\angle C)$



2016 Exam (6) Question (3) (a)

4

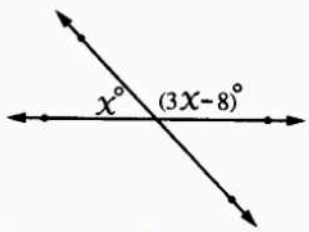
Using the geometric tools , draw the angle ABC of measure 140 , then bisect it. (don't remove arcs).

2017 Exam (12) Question (4) (b)

5

In the opposite figure :

Find the value of x



2016 Exam (3) Question (3) (b)

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6 Find the number of sides of the regular polygon if the measure of its interior angle is 135°

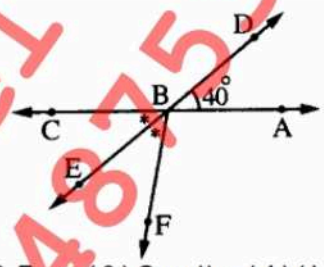
2016 Exam (14) Question (5) (a)

7 Mention two cases of congruency of two triangles.

2017 Exam (12) Question (5) (a)

8 **In the opposite figure :**

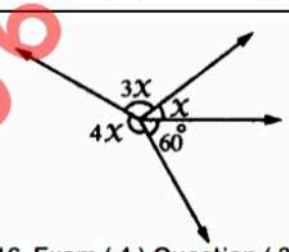
Find : m (∠ ABF)



2016 Exam (3) Question (4) (b)

9 **In the opposite figure :**

Find : the value of x



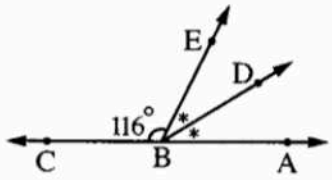
2016 Exam (4) Question (3) (b)

10 **In the opposite figure :**

$B \in \overleftrightarrow{AC}$, m (∠ CBE) = 116°

and $\overrightarrow{BD}$ bisect ∠ ABE

Find with proof : m (∠ ABD)



2016 Exam (12) Question (5) (a)

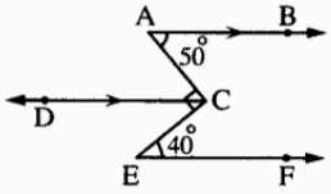
11 **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD}$, m (∠ A) = 50° ,

∠ ACE is right angle ,

and m (∠ E) = 40°

Prove that : $\overrightarrow{AB} // \overrightarrow{EF}$



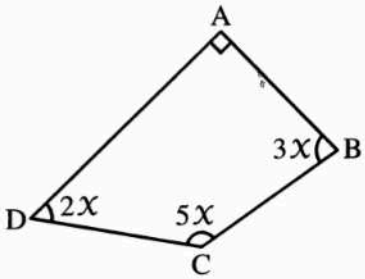
2016 Exam (5) Question (5) (b)

12 **In the opposite figure :**

ABCD is a quadrilateral

in which : m (∠ A) = 90°

Find : the value of x



2018 Exam (11) Question (3) (a)

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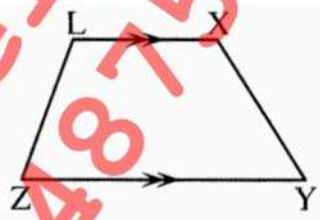
Lesson [2] : Part [2] : The Polygon

Trapezium – Parallelogram – Rectangle – Rhombus – Square

Trapezium :

A quadrilateral in which only two sides are parallel is called a trapezium , as shown in the opposite figure in which :

$\overline{XL} \parallel \overline{YZ}$



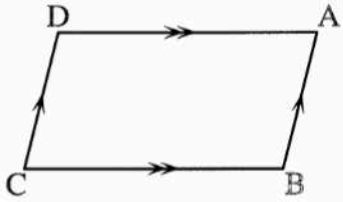
Definition

Parallelogram is a quadrilateral , in which each two opposite sides are parallel.

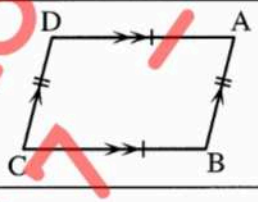
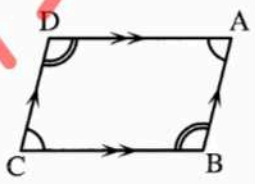
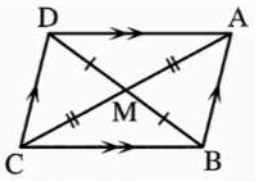
In the opposite figure

ABCD is a parallelogram because

$\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$



Properties of parallelogram :

1 Each two opposite sides are equal in length.		• AB = DC • AD = BC
2 Each two opposite angles are equal in measure.		• m (∠ A) = m (∠ C) • m (∠ B) = m (∠ D)
3 The sum of measures of each two consecutive angles is 180°		• m (∠ A) + m (∠ B) = 180° • m (∠ B) + m (∠ C) = 180° • m (∠ C) + m (∠ D) = 180° • m (∠ D) + m (∠ A) = 180°
4 The two diagonals bisect each other.		• AM = CM • BM = DM

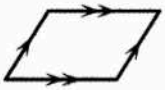
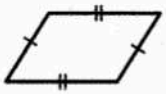
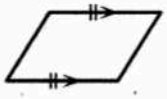
Remark [1]

The perimeter of the parallelogram = The sum of two consecutive sides × 2

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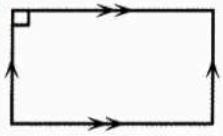
When does a quadrilateral represent a parallelogram ?

A quadrilateral represents a parallelogram if one of the following conditions satisfies

Each two opposite sides are parallel.	Each two opposite sides are equal in length.	Two opposite sides are parallel and equal in length.	Each two opposite angles are equal in measure.	The two diagonals bisect each other.
				

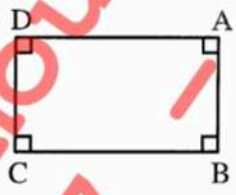
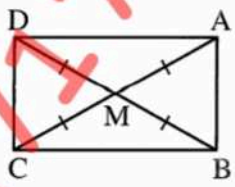
Rectangle :

Rectangle is a parallelogram with a right angle.



Properties Of Rectangle :

The rectangle has the same properties of the parallelogram and some additional properties as the following :

1 The four angles of the rectangle are all equal in measure and the measure of each is 90°		m (∠ A) = m (∠ B) = m (∠ C) = m (∠ D) = 90°
2 The two diagonals of the rectangle are equal in length.		AC = BD and as the two diagonals bisect each other , then AM = BM = CM = DM

Remark [2]

The perimeter of the rectangle = (length + width) × 2

Rhombus :

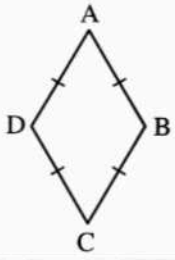
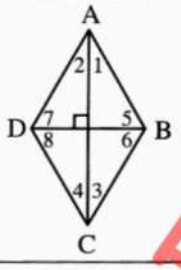
Rhombus is a parallelogram in which two adjacent sides are equal in length.



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Properties Of Rhombus :

The rhombus has the same properties of the parallelogram and some additional properties as the following :

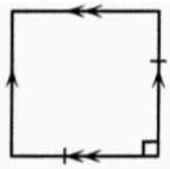
1 The four sides of the rhombus are all equal in length.		• AB = BC = CD = DA
2 The two diagonals of the rhombus are perpendicular and bisect each of its interior angles.		• $\overline{AC} \perp \overline{BD}$ • m (∠ 1) = m (∠ 2) = m (∠ 3) = m (∠ 4) • m (∠ 5) = m (∠ 6) = m (∠ 7) = m (∠ 8)

Remark [3]

The perimeter of the rhombus = the length of one side × 4

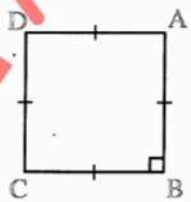
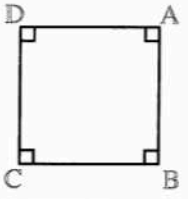
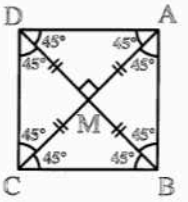
Square :

Square is a parallelogram with a right angle and two adjacent sides are equal in length.



Properties Of Square :

The square has the same properties of the parallelogram and some additional properties as the following :

1 Its four sides are all equal in length.		• AB = BC = CD = DA
2 Its four angles are all equal in measure and each of them is of measure 90°		• m (∠ A) = m (∠ B) = m (∠ C) = m (∠ D) = 90°
3 Its two diagonals are equal in length , perpendicular and each diagonal bisects the two vertices angles which this diagonal joins.		• AC = BD and hence AM = BM = CM = DM • $\overline{AC} \perp \overline{BD}$

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Remark [4]

The perimeter of the square = the length of one side × 4

Notice That : -

We can also define the square as follows :

1. A square is a rectangle with two adjacent sides equal in length.
2. A square is a rectangle with two perpendicular diagonals.
3. A square is a rhombus with a right angle.
4. A square is a rhombus with two diagnals equal in length.

Notice That : -

To prove that the quadrilateral is a rectangle , a rhombus or a square , we must first prove that it is a parallelogram , as we see in the previous lesson , then :

The parallelogram is

a rectangle	a rhombus	a square
if :	**if :**	**if :**
One of its angles is a right angle	Two adjacent sides are equal in length.	One of its angles is right and two adjacent sides are equal in length.
or	**or**	**or**
Its two diagonals are equal in length.	Its two diagonals are perpendicular.	One of its angles is right and its two diagonals are perpendicular.
		or
		Its two diagonals are perpendicular and equal in length.
		or
		Two adjacent sides are equal in length and its two diagonals are equal in length.

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Examples :

1 Calculate the sum of the measures of the interior angles of a hexagon.

2014 Exam (12) Question (3) (a)

2 Find the measure of each interior angle of regular hexagon.

2014 Exam (9) Question (4) (a)

3 How many sides does a regular polygon have if the measure of each interior angle of it is 120° ?

2014 Exam (6) Question (3) (b)

4 Find the number of sides of a regular polygon if the measure of one of its exterior angle is 45°

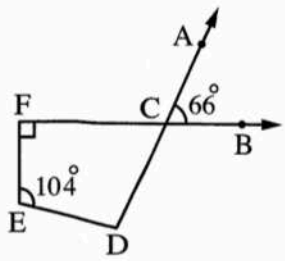
2015 Exam (5) Question (4) (a)

5 **In the opposite figure :**

$\overline{EF} \perp \overrightarrow{FB}$, $\overrightarrow{DA} \cap \overrightarrow{FB} = \{C\}$,

$m(\angle ACB) = 66°$, $m(\angle E) = 104°$

Find : $m(\angle D)$



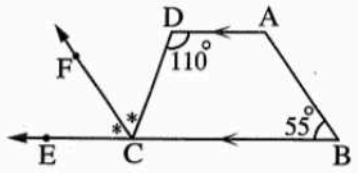
2015 Exam (15) Question (4) (b)

6 **In the opposite figure :**

$\overline{AD} // \overrightarrow{BC}$, $\overrightarrow{CF}$ bisects $\angle DCE$

, $m(\angle ABC) = 55°$, $m(\angle ADC) = 110°$

Prove that : $\overline{AB} // \overrightarrow{CF}$

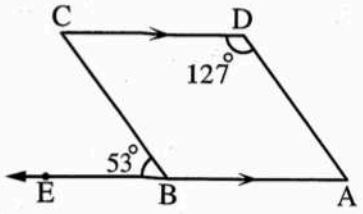


2017 Exam (12) Question (3) (a)

7 **In the opposite figure :**

$\overline{DC} // \overline{AB}$, $E \in \overrightarrow{AB}$, $m(\angle CBE) = 53°$, $m(\angle D) = 127°$

Prove that : $\overline{AD} // \overline{BC}$



2015 Exam (11) Question (3) (a)

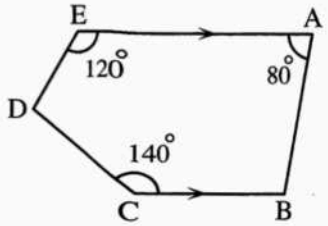
8 **In the opposite figure :**

ABCDE is a pentagon in which $\overline{AE} // \overline{BC}$,

$m(\angle A) = 80°$, $m(\angle C) = 140°$, $m(\angle E) = 120°$

Find : ① $m(\angle B)$

② $m(\angle D)$



2015 Exam (4) Question (4) (a)

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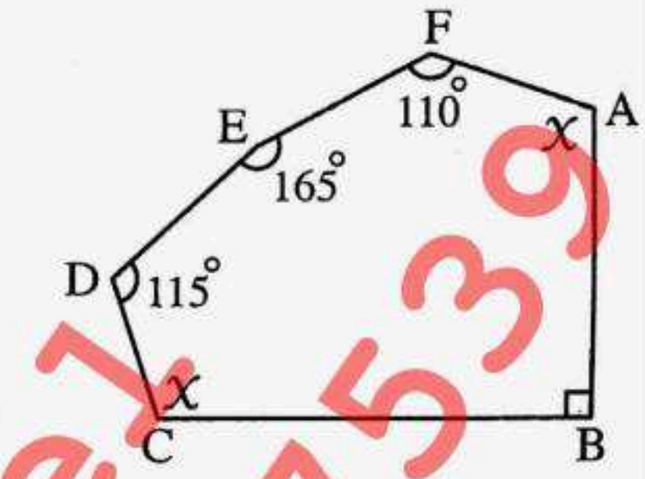
9 **In the opposite figure :**

ABCDEF is a hexagon , m (∠ B) = 90° ,

m (∠ F) = 110° , m (∠ E) = 165° , m (∠ D) = 115° ,

m (∠ FAB) = m (∠ DCB) = χ

Find : the value of χ



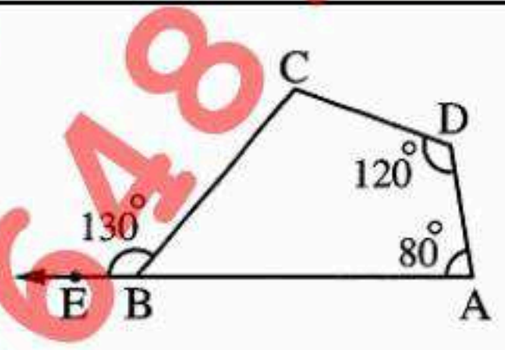
2014 Exam (11) Question (3) (b)

10 **In the opposite figure :**

m (∠ A) = 80° , m (∠ D) = 120°

, m (∠ CBE) = 130°

Find : m (∠ C)



Model Exam (5) Question (5) (a)

Solutions

1 The sum = (6 – 2) × 180° = 720°

2 The measure of each interior angle = $\frac{(6-2)\times 180°}{6}$ = 120°

3 The number of sides = $\frac{360°}{180° - 120°}$ = 6 sides

4 The number of sides = $\frac{360°}{45°}$ = 8 sides

5 ∵ $\overrightarrow{DA} \cap \overrightarrow{FB} = \{C\}$

∴ m (∠ DCF) = m (∠ ACB) = 66° (V.O.A.)

From quadrilateral CDEF :

∴ m (∠ D) = 360° – (104° + 66° + 90°) = 100°

(The req.)

6 ∵ $\overline{AD} \parallel \overrightarrow{BC}$, $\overleftrightarrow{DC}$ is a transversal

∴ m (∠ DCE) = m (∠ ADC) = 110°

(alternate angles)

, ∵ $\overrightarrow{CF}$ bisects ∠ DCE

∴ m (∠ FCE) = $\frac{110°}{2}$ = 55°

, ∵ m (∠ B) = m (∠ FCE) = 55°

and they are corresponding angles.

∴ $\overline{AB} \parallel \overrightarrow{CF}$ (Q.E.D.)

7 ∵ $\overline{DC} \parallel \overline{AB}$, $\overleftrightarrow{AD}$ is a transversal

∴ m (∠ A) + m (∠ D) = 180°

(Two interior angles in the same side of the transversal).

∴ m (∠ A) = 180° – 127° = 53°

∴ m (∠ A) = m (∠ CBE) = 53°

and they are corresponding angles.

∴ $\overline{AD} \parallel \overline{BC}$ (Q.E.D.)

8 ∵ $\overline{AE} \parallel \overline{BC}$, $\overleftrightarrow{AB}$ is a transversal

∴ m (∠ A) + m (∠ B) = 180°

Two interior angles in the same side of the transversal.

∴ m (∠ B) = 180° – 80° = 100° (First req.)

From pantagon ABCDE :

∴ m (∠ D) = 540° – (120° + 80° + 100° + 140°)

= 100° (Second req.)

9 ∵ 2 χ = 720° – (110° + 90° + 165° + 115°) = 240°

∴ χ = 240° ÷ 2 = 120° (The req.)

10 ∵ B ∈ $\overrightarrow{AE}$

∴ m (∠ ABC) = 180° – 130° = 50°

∴ From the quadrilateral ABCD :

m (∠ C) = 360° – (50° + 80° + 120°)

= 360° – 250° = 110° (The req.)

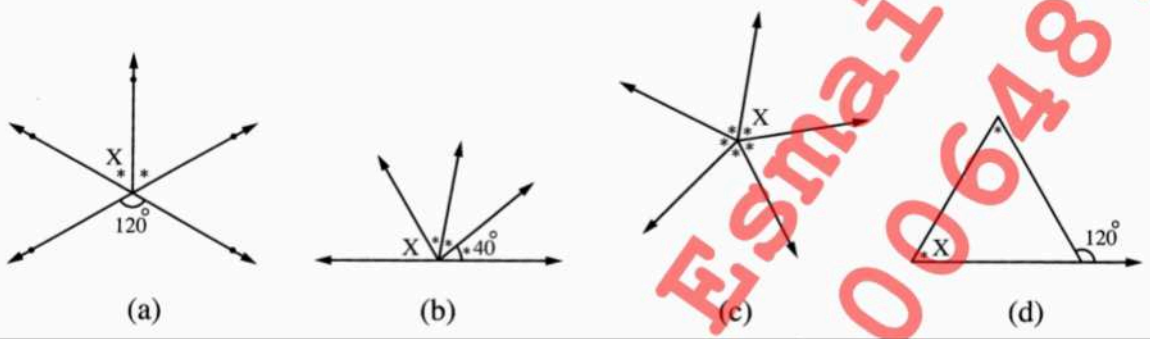
Exercises

[A] : Choose The Correct Answer : -

1 The acute angle supplements ..... angle.

(a) acute (b) right (c) obtuse (d) straight

2 In all the following shapes m (∠ X) = 60° except the shape .....



(a) (b) (c) (d)

3 The sum of measures of the exterior angles of the hexagon = ...

(a) 720 ° (b) 120 ° (c) 180 ° (d) 360 °

4 How many sides has a regular polygon if the measure of each interior angle of it is 120° ?

(a) 5 (b) 6 (c) 7 (d) 8

5 The diagonal of the square makes an angle of measure ..... with any of its sides.

(a) 60° (b) 45° (c) 120° (d) 90°

6 The rectangle is a parallelogram each of its angles is .....

(a) obtuse. (b) acute. (c) right. (d) straight.

7 If ABCD is a rhombus , then $\overline{AC} \perp$ .....

(a) $\overline{BD}$ (b) $\overline{AB}$ (c) $\overline{BC}$ (d) $\overline{CD}$

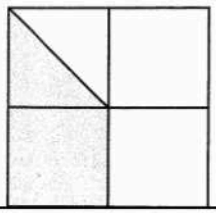
8 The number of axis of symmetry of a square equal .....

(a) 0 (b) 1 (c) 2 (d) 4

9 The angle with measure 70° complement angle with measure .....°

(a) 70 (b) 110 (c) 290 (d) 20

10 The area of the shaded part = ... the total area of the shape.



(a) $\frac{1}{8}$ (b) $\frac{1}{4}$

(c) $\frac{3}{8}$ (d) $\frac{3}{4}$

11 The sum of the measures of the interior angles of a pentagon is .....

(a) 360° (b) 450° (c) 720° (d) 540°

12 The rhombus of diagonals equal in length is .....

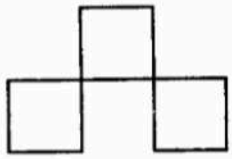
(a) a square. (b) a rectangle. (c) a trapezium. (d) a parallelogram.

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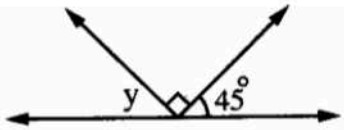
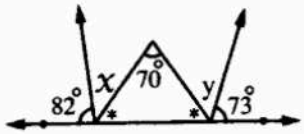
13	The measure of the interior angle of a regular polygon of 18 sides equals ..... (a) 130° (b) 140° (c) 150° (d) 160°	
14	The diagonals are equal in length and perpendicular in ..... **(a)** square. **(b)** rhombus. **(c)** rectangle. **(d)** parallelogram.	
15	The measure of the right angle = ... ° (a) 180 (b) 90 (c) 120 **(d)** 0	
16	If ABCD is a parallelogram in which BC = 8 cm. and CD = 6 cm. , then its perimeter = ... (a) 14 cm. (b) 28 cm. (c) 48 cm. (d) 56 cm.	
17	The side length of the rhombus which its perimeter 36 cm. is ..... cm. (a) 6 (b) 9 (c) 18 (d) 4	
18	If ABCD is a square , then $(AC)^2$ = ... (a) AB (b) $(AB)^2$ (c) 2 $(AB)^2$ (d) 4 $(AB)^2$	
19	If $\Delta ABC \equiv \Delta XYZ$, then AB = ... (a) XY (b) YZ (c) XZ (d) BC	
20	The edge length of a cube whose total area is 600 cm^2. is ..... cm. (a) 10 (b) 100 (c) 300 (d) 90	
21	The sum of the measures of the interior angles of a triangle = ...° (a) 90 (b) 360 (c) 180 (d) 540	
22	The measure of each angle of the regular hexagon is ..... (a) 90° (b) 180° (c) 120° (d) 144°	
23	In the ..... the two diagonals are perpendicular and not equal in length. (a) square (b) rhombus (c) rectangle (d) parallelogram	
24	ABCD is a parallelogram , m (∠ A) = 70° , then m (∠ C) = ... ° **(a)** 110 **(b)** 35 **(c)** 70 **(d)** 140	
25	In a parallelogram if the adjacent sides are equal in the length , then the shape is ..... (a) square. (b) rhombus. (c) rectangle. (d) trapezium.	
26	ABCD is a square , then m (∠ BAC) = ...° (a) 90 (b) 60 (c) 45 (d) 30	
27	If the side length of a square is 10.5 cm. , then the perimeter of this square = ... cm. (a) 40 (b) 42 (c) 50 (d) 100	
28	* The parallelogram whose two diagonals are equal in length and perpendicular is called ..... **(a)** rectangle. **(b)** square. **(c)** rhombus. **(d)** trapezium.	

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[B] : Complete the Following : -

1	The angle of measure 180° its type is .....
2	If two straight lines intersect , then the measures of each two vertically opposite angles are .....
3	A circle its radius length 10 cm. , then its circumference = ... (Consider $\pi = 3.14$)
4	Each two opposite angles in a parallelogram are .....
5	If ABCD is a parallelogram in which : m (∠ A) = 120° , then m (∠ B) = ...°
6	The rectangle is a parallelogram in which one of it's angles is .....
7	The number of axis of symmetry of square is .....
8	The two vertically opposite angles are .....
9	The opposite figure represents 3 squares each of side length 1 cm. , the perimeter of the figure = ... 
10	If two opposite sides in the quadrilateral are parallel , then it is called .....
11	ABCD is parallelogram in which m (∠ A) = 100° , then m (∠ D) = ...°
12	If ABCD is rectangle and if AB = 4 cm. , BD = 5 cm. , then the area of the rectangle = ...
13	Square is a rectangle in which .....
14	The sum of the measures of the accumulative angles at a point is .....°
15	If a straight line intersects two parallel straight lines , then every two interior angles in the same side of the transversal are .....
16	The measure of each interior angle of the regular pentagon = ...

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17	If ABCD is a parallelogram in which m (∠ A) = 80° , then m (∠ B) = ...
18	Two diagonals are equal in length and not perpendicular in .....
19	The rhombus with a right angle is .....
20	The measure of the right angle = ...°
21	If two straight lines intersect , then the sum of measures of any two adjacent angles is .....
22	The measure of each interior angle of the regular hexagon is .....°
23	ABCD is a parallelogram in which m (∠ A) = 60° , then m (∠ B) = ...
24	In the parallelogram XYZL , if m (∠ X) = $\frac{1}{2}$ m (∠ Y) , then m (∠ Y) = ...°
25	The length of the side of a rhombus whose perimeter is 24 cm. equals ..... cm.
26	**In the oppoiste figure :** y = ...° 
27	The measure of the straight angle equals .....°
28	Each two opposite angles in a parallelogram are .....
29	The sum of the measures of the angles of the quadrilateral equals .....
30	ABCD is a parallelogram in which m (∠ A) = 50° , then m (∠ B) = ...
31	In the parallelogram XYZL , if m (∠ X) = $\frac{1}{3}$ m (∠ Y) , then m (∠ L) = ...°
32	The number of axes of symmetry of the rhombus is ..... axes.
33	**In the opposite figure :** $x + y$ = ...° 

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[C] : Essay Problems : -

1

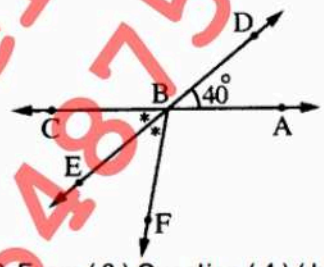
Using the geometric tools , draw the angle ABC of measure 140 , then bisect it. (don't remove arcs).

2017 Exam (12) Question (4) (b)

2

In the opposite figure :

Find : m (∠ ABF)



2016 Exam (3) Question (4) (b)

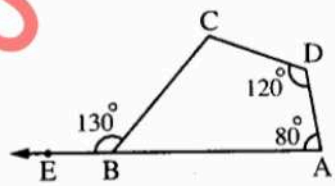
3

In the opposite figure :

m (∠ A) = 80° , m (∠ D) = 120° ,

m (∠ CBE) = 130° and B ∈ $\overrightarrow{AE}$

Find with proof : m (∠ C)



2016 Exam (6) Question (3) (a)

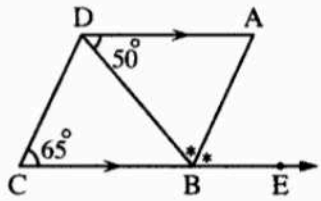
4

In the opposite figure :

$\overrightarrow{DA}$ // $\overleftrightarrow{BE}$, $\overrightarrow{BA}$ bisects ∠ DBE ,

m (∠ ADB) = 50° and m (∠ C) = 65°

Prove that : ABCD is a parallelogram.

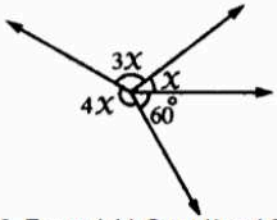


2016 Exam (13) Question (4) (a)

5

In the opposite figure :

Find : the value of x



2016 Exam (4) Question (3) (b)

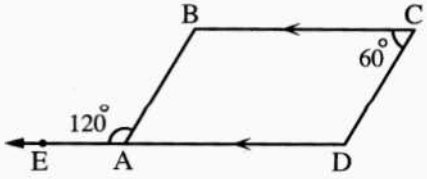
6

In the opposite figure :

E ∈ $\overrightarrow{DA}$, m (∠ EAB) = 120°

, m (∠ C) = 60° , $\overrightarrow{DA}$ // $\overline{CB}$

Prove that : ABCD is a parallelogram



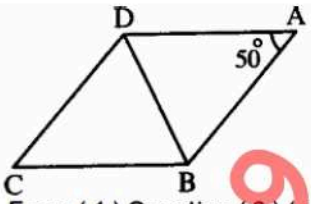
2018 Exam (4) Question (5) (a)

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7 **In the opposite figure :**

ABCD is a rhombus in which :

$m(\angle A) = 50°$, **find :** $m(\angle ABD)$



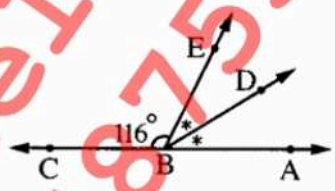
2016 Exam (1) Question (3) (a)

8 **In the opposite figure :**

$B \in \overleftrightarrow{AC}$, $m(\angle CBE) = 116°$

and $\overrightarrow{BD}$ bisect $\angle ABE$

Find with proof : $m(\angle ABD)$



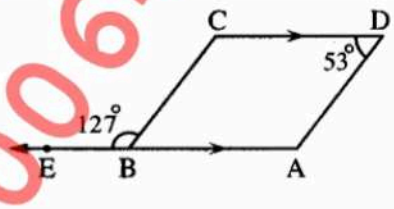
2016 Exam (12) Question (5) (a)

9 **In the opposite figure :**

$\overline{DC} // \overrightarrow{AB}$, $m(\angle D) = 53°$

and $m(\angle CBE) = 127°$

Prove that : ABCD is a parallelogram.



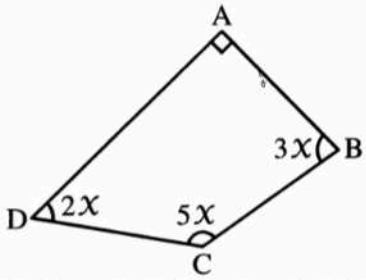
2016 Exam (8) Question (3) (a)

10 **In the opposite figure :**

ABCD is a quadrilateral

in which : $m(\angle A) = 90°$

Find : the value of x



2018 Exam (11) Question (3) (a)

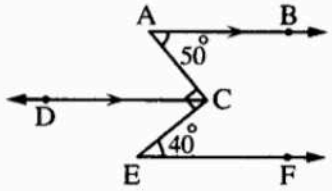
11 **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD}$, $m(\angle A) = 50°$,

$\angle ACE$ is right angle ,

and $m(\angle E) = 40°$

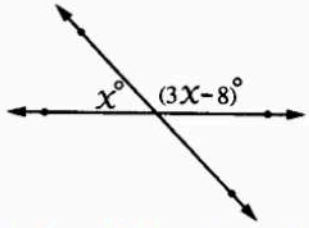
Prove that : $\overrightarrow{AB} // \overrightarrow{EF}$



2016 Exam (5) Question (5) (b)

12 **In the opposite figure :**

Find the value of x



2016 Exam (3) Question (3) (b)

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Homework

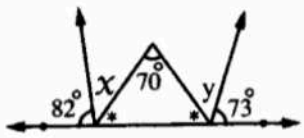
[A] : Choose The Correct Answer : -

1	The side length of the rhombus which its perimeter 36 cm. is ..... cm. (a) 6 (b) 9 (c) 18 (d) 4
2	ABCD is a parallelogram , m (∠ A) = 70° , then m (∠ C) = ...° **(a)** 110 **(b)** 35 **(c)** 70 **(d)** 140
3	The two diagonals are equal in length and not perpendicular in ..... (a) a rectangle (b) a square (c) a rhombus (d) a parallelogram
4	If the number of sides of a regular polygon is 5 and if the measure of each interior angle is (x°) , then x = ... (a) 90° (b) 108° (c) 120° (d) 180°
5	If the measure of an interior angle of a regular polygon is 135° , then the number of its sides is ..... (a) 6 (b) 4 (c) 7 (d) 8
6	In the ..... the two diagonals are perpendicular and not equal in length. (a) square (b) rhombus (c) rectangle (d) parallelogram
7	The measure of the interior angle of a regular pentagon = ... (a) 900° (b) 180° (c) 540° (d) 108°
8	The pentagon has ..... sides. (a) 3 (b) 4 (c) 5 (d) 6
9	The measure of the exterior angle of the equilateral triangle = ... (a) 60° (b) 90° (c) 30° (d) 120°
10	The measure of each angle of the regular hexagon is ..... (a) 90° (b) 180° (c) 120° (d) 144°
11	The sum of the measures of the exterior angles of a polygon of n sides is ..... (a) (n – 2) (b) (n – 2) × 180° (c) 360° (d) $\frac{(n-2)\times 180°}{n}$
12	The two bisectors of two adjacent supplementary angles included an angle of measure .....° (a) 180 (b) 45 (c) 90 (d) 0
13	The hexagon has ..... sides. (a) 5 (b) 6 (c) 7 (d) 8
14	The sum of the measures of the interior angles of a triangle = ...° (a) 90 (b) 360 (c) 180 (d) 540

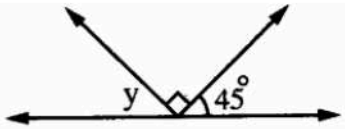
15	The perpendicular to one of two parallel lines is ..... to the other. (a) parallel (b) equal (c) congruent (d) perpendicular	
16	The angle whose measure 90° is ..... angle. (a) acute (b) right (c) obtuse (d) straight	
17	The area of the circle = ... (a) πr (b) πr^2 (c) $2 \pi r$ (d) $2 \pi r^2$	
18	The edge length of a cube whose total area is 600 cm^2. is ..... cm. (a) 10 (b) 100 (c) 300 (d) 90	
19	**The sum of the measures of the accumulative angles at a point = ...** **(a) 90° (b) 180° (c) 270° (d) 360°**	
20	The area of square of side length 3 cm is ..... cm^2. (a) 9 (b) 6 (c) 12 (d) 3	
21	The perimeter of a square with side length 6 cm. = ... cm. (a) 30 (b) 36 (c) 24 (d) 216	
22	The diagonal of square divided its vertex angle in two angles of the measure of each of them is ..... (a) 30° (b) 45° (c) 60° (d) 90°	
23	If $\Delta ABC \equiv \Delta XYZ$, then AB = ... (a) XY (b) YZ (c) XZ (d) BC	
24	If the side length of a square is 10.5 cm. , then the perimeter of this square = ... cm. (a) 40 (b) 42 (c) 50 (d) 100	
25	* The parallelogram whose two diagonals are equal in length and perpendicular is called ..... (a) rectangle. (b) square. (c) rhombus. (d) trapezium.	
26	The rectangle of perpendicular diagonals is ..... (a) a parallelogram. (b) a square. (c) a rhombus. (d) a trapezium.	
27	If ABCD is a rhombus and m ($\angle$ ACB) = 32° , then m ($\angle$ B) = ... (a) 148° (b) 161° (c) 116° (d) 32°	
28	If ABCD is a square , then $(AC)^2$ = ... (a) AB (b) $(AB)^2$ (c) $2 (AB)^2$ (d) $4 (AB)^2$	
29	ABCD is a square , then m ($\angle$ BAC) = ...° (a) 90 (b) 60 (c) 45 (d) 30	
30	If ABCD is a parallelogram , then m ($\angle$ A) = m ($\angle$ .....) (a) B (b) C (c) D (d) nothing	

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[B] : Complete the Following : -

1	The angle of measure 180° its type is .....
2	The two vertically opposite angles are .....
3	The measure of each interior angle of the regular pentagon = ...
4	In the parallelogram XYZL , if m (∠ X) = $\frac{1}{2}$ m (∠ Y) , then m (∠ Y) = ...°
5	The number of axes of symmetry of the rhombus is ..... axes.
6	The number of axis of symmetry of square is .....
7	If a straight line intersects two parallel straight lines , then every two interior angles in the same side of the transversal are .....
8	ABCD is a parallelogram in which m (∠ A) = 60° , then m (∠ B) = ...
9	In the parallelogram XYZL , if m (∠ X) = $\frac{1}{3}$ m (∠ Y) , then m (∠ L) = ...°
10	**In the opposite figure :** $x + y$ = ...° 
11	The rectangle is a parallelogram in which one of it's angles is .....
12	The sum of the measures of the accumulative angles at a point is .....°
13	The measure of each interior angle of the regular hexagon is .....°
14	ABCD is a parallelogram in which m (∠ A) = 50° , then m (∠ B) = ...
15	The two diagonals of the rhombus are .....
16	If ABCD is a parallelogram in which : m (∠ A) = 120° , then m (∠ B) = ...°
17	Square is a rectangle in which .....

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18	If two straight lines intersect , then the sum of measures of any two adjacent angles is .....
19	The sum of the measures of the angles of the quadrilateral equals .....
20	ABCD is a parallelogram in which m (∠ A) = 130° , then m (∠ B) = ...°
21	Each two opposite angles in a parallelogram are .....
22	If ABCD is rectangle and if AB = 4 cm. , BD = 5 cm. , then the area of the rectangle = ...
23	The measure of the right angle = ...°
24	Each two opposite angles in a parallelogram are .....
25	The parallelogram whose diagonals are equal in length and not perpendicular is .....
26	A circle its radius length 10 cm. , then its circumference = ... (Consider $\pi = 3.14$)
27	ABCD is parallelogram in which m (∠ A) = 100° , then m (∠ D) = ...°
28	The rhombus with a right angle is .....
29	The measure of the straight angle equals .....°
30	The sum of the measures of the exterior angles of the convex polygon = ...
31	If two straight lines intersect , then the measures of each two vertically opposite angles are .....
32	If two opposite sides in the quadrilateral are parallel , then it is called .....
33	Two diagonals are equal in length and not perpendicular in .....
34	**In the oppoiste figure :** y = ...° 

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[C] : Essay Problems : -

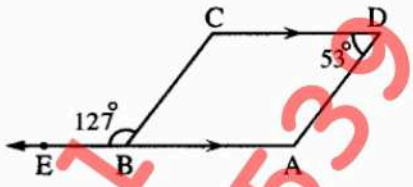
1

In the opposite figure :

$\overrightarrow{DC} // \overrightarrow{AB}$, m ($\angle$ D) = 53°

and m ($\angle$ CBE) = 127°

Prove that : ABCD is a parallelogram.



2016 Exam (8) Question (3) (a)

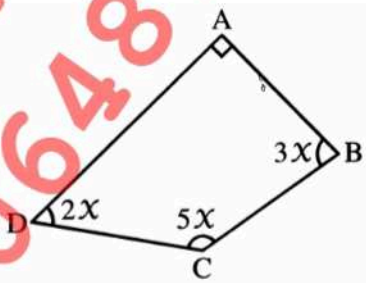
2

In the opposite figure :

ABCD is a quadrilateral

in which : m ($\angle$ A) = 90°

Find : the value of x



2018 Exam (11) Question (3) (a)

3

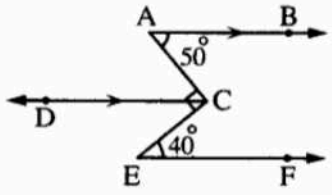
In the opposite figure :

$\overrightarrow{AB} // \overrightarrow{CD}$, m ($\angle$ A) = 50° ,

$\angle$ ACE is right angle ,

and m ($\angle$ E) = 40°

Prove that : $\overrightarrow{AB} // \overrightarrow{EF}$

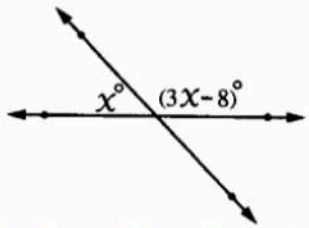


2016 Exam (5) Question (5) (b)

4

In the opposite figure :

Find the value of x



2016 Exam (3) Question (3) (b)

5

Find the number of sides of the regular polygon if the measure of its interior angle is 135°

2016 Exam (14) Question (5) (a)

6

Mention two cases of congruency of two triangles.

2017 Exam (12) Question (5) (a)

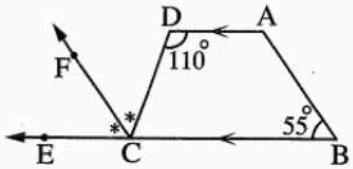
7

In the opposite figure :

$\overrightarrow{AD} // \overrightarrow{BC}$, $\overrightarrow{CF}$ bisects $\angle$ DCE

, m ($\angle$ ABC) = 55° , m ($\angle$ ADC) = 110°

Prove that : $\overrightarrow{AB} // \overrightarrow{CF}$



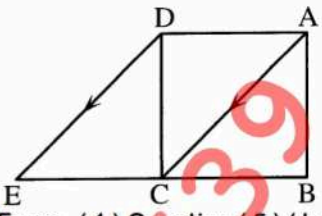
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2017 Exam (11) Question (5) (b)

8 **In the opposite figure :**

ABCD is a square , $E \in \overrightarrow{BC}$, $\overline{AC} \parallel \overline{DE}$

Prove that : ACED is a parallelogram.



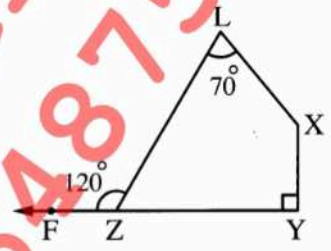
Model 2018 Exam (1) Question (5) (b)

9 **In the opposite figure :**

$F \in \overrightarrow{YZ}$, m ($\angle$ L) = 70°

, m ($\angle$ Y) = 90° and m ($\angle$ LZF) = 120°

Find : m ($\angle$ X)



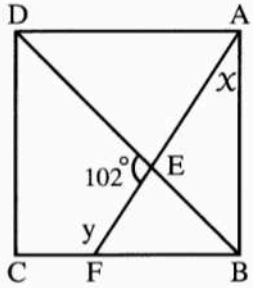
2018 Exam (13) Question (3) (b)

10 **In the opposite figure :**

ABCD is a square

, find in degrees the value

of each of x and y



2018 Exam (12) Question (4) (a)

11 **In the opposite figure :**

ABCD is a parallelogram in which :

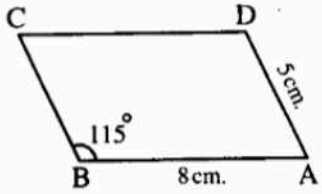
m ($\angle$ B) = 115° , AB = 8 cm.

and AD = 5 cm.

Find with proof :

(1) m ($\angle$ D)

(2) The perimeter of parallelogram ABCD



2016 Exam (14) Question (4) (a)

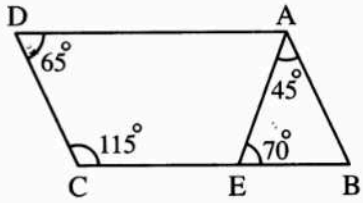
12 **In the opposite figure :**

$E \in \overline{BC}$, m ($\angle$ BAE) = 45° ,

m ($\angle$ AEB) = 70° , m ($\angle$ D) = 65°

and m ($\angle$ C) = 115°

Prove that : ABCD is a parallelogram.



2018 Exam (14) Question (4) (b)

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1. Choose the correct answer:

1 The multiplicative inverse of the number $\left(\frac{2}{5}\right)^0$ is .....

(a) $\frac{5}{2}$ (b) $-\frac{2}{5}$ (c) 1 (d) 0

2 The additive inverse of the number $(-3)^0$ is .....

(a) 1 (b) -3 (c) 3 (d) $-(3)^0$

3 The multiplicative inverse of the number $(-1)^3$ is .....

(a) $(-1)^3$ (b) $(-1)^2$ (c) 1^3 (d) 1^2

4 The additive inverse of the number $\left(-\frac{2}{5}\right)^2$ is .....

(a) $\frac{4}{25}$ (b) $-\frac{4}{25}$ (c) $\frac{25}{4}$ (d) $-\frac{25}{4}$

5 $\left(\frac{1}{4}\right)^0 + \frac{1}{4} =$ .....

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{5}{4}$ (d) $\frac{2}{4}$

6 $\left(\frac{5}{3}\right)^2 \times \left(\frac{3}{5}\right)^0 =$ .....

(a) $\frac{5}{3}$ (b) $\frac{25}{9}$ (c) 0 (d) 1

7 If $x = y$, then $\left(\frac{3}{5}\right)^{x-y} =$ .....

(a) $\frac{3}{5}$ (b) $\frac{5}{3}$ (c) 1 (d) 0

8 $\left(\frac{a}{b}\right)^2 \times \frac{b^2}{a^2} =$ ..... (where $ab \neq 0$)

(a) ab (b) $\left(\frac{a}{b}\right)^4$ (c) $(ab)^0$ (d) $\frac{a}{b}$

9 If $x = -\frac{1}{2}$ and $y = 3$, then $x^y =$ .....

(a) $\frac{1}{8}$ (b) $-\frac{1}{8}$ (c) $\frac{1}{6}$ (d) $-\frac{1}{6}$

10 If $y^{26} + y^{27} = 0$, then $y =$ .....

(a) 1 (b) -1 (c) 2 (d) -2

11 $3^2 \times 3^5 =$ .....

(a) 3^7 (b) 3^3 (c) 3^{10} (d) 3^{25}

12 $5^2 + 5^2 =$ .....

(a) 10^2 (b) 10^4 (c) 5^4 (d) 50

13 $3^5 \times 2^5 =$ .....

(a) 5^{10} (b) 6^{10} (c) 6^5 (d) 6^{25}

14 $(5a)^0 =$ ..... , $a \neq 0$

(a) 5 (b) a (c) 5 a (d) 1

15 $3^{(2^3)} =$ .....

(a) 3^6 (b) 3^5 (c) 3^8 (d) 3^{23}

16 $(5^2)^3 =$ .....

(a) 5^6 (b) 5^5 (c) 5^{23} (d) 5

17 $3^{10} + 3^{10} + 3^{10} =$ .....

(a) 3^{10} (b) 3^{30} (c) 9^{10} (d) 3^{11}

18 $4^x + 4^x + 4^x + 4^x =$ .....

(a) 4^{x+4} (b) 4^{4x} (c) 4^{x+1} (d) $4x^4$

19 $\frac{(3^2)^5}{(3^5)^2} =$ .....

(a) 3^{10} (b) 3^{52} (c) 3^{25} (d) 1

20 $\frac{(x^2)^3}{x^3} =$ ..... , $x \neq 0$

(a) x^6 (b) x^2 (c) x^3 (d) x

21 $(2y)^3 =$ .....

(a) $2y^3$ (b) $8y$ (c) $8y^3$ (d) $23y$

22 $(b^3)^4 =$ .....

(a) b^{34} (b) b^7 (c) $b^3 \times b^3 \times b^3$ (d) $b^4 \times b^4 \times b^4$

23 If $a^{-1} = \frac{2}{3}$, then a = ...

(a) $-\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $-\frac{3}{2}$ (d) 1

24 If $a = 7^{x}$ and $b = 7^{-x}$, then $a \times b$ = ...

(a) 7^{2x} (b) 49^{2x} (c) 1 (d) 0

25 $\frac{5^{x}}{5^{-y}}$ = ...

(a) $5^{x \div y}$ (b) 5^{x-y} (c) 5^{x+y} (d) $-\frac{x}{y}$

26 📖 $\frac{6\,a^2\,x^4}{2\,a^3\,x^3}$ = ...

(a) $3\,a\,x$ (b) $3\,a^5\,x^7$ (c) $\frac{3x}{a}$ (d) $\frac{3}{a\,x}$

27 📖 $\frac{(-2\,s^2\,t)^3}{(-4\,s\,t^2)^2}$ = ...

(a) $-\frac{s^3}{2t}$ (b) $-\frac{s^4}{2t}$ (c) $\frac{s^5}{2\,t^2}$ (d) $\frac{s^4}{t}$

28 📖 $\left(\frac{m^2}{n^{-3}}\right)^{-1}\left(\frac{3\,m^{-2}}{n^{-2}}\right)^{-2}$ = ...

(a) $\frac{9\,m^2}{n^7}$ (b) $\frac{m^2}{9\,n^7}$ (c) $\frac{m^2}{9\,n}$ (d) $\frac{9\,m^6}{n}$

29 📖 $\frac{(2\,a\,b^{-2})^0}{3^0\,a^{-2}\,b}$ = ...

(a) $\frac{a^3}{3\,b^3}$ (b) a^2 (c) 1 (d) $\frac{a^2}{b}$

30 If $a^{x} = 2$ and $a^{-y} = 3$, then a^{x-y} = ...

(a) 1 (b) -1 (c) $\frac{2}{3}$ (d) 6

31 If $x\,y^{-1} = \frac{1}{2}$, then $\frac{y}{x}$ = ...

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) 1 (d) 2

32 $3^{-1} + 3^{-1} + 3^{-1}$ = ...

(a) 3^{-3} (b) 3^3 (c) 9^{-3} (d) 1

33 The multiplicative inverse of 5^{-1} is .....

(a) $\frac{1}{5}$ (b) 5 (c) -5 (d) $-\frac{1}{5}$

34 $(\frac{3}{5})^2 \times (\frac{5}{3})^{-2}$ = ...

(a) $(\frac{3}{5})^4$ (b) 1 (c) $(\frac{3}{5})^{-4}$ (d) 0

35 3.04×10^7 = ...

(a) 340 000 (b) 304 000 (c) 3 400 000 (d) 30 400 000

36 📖 2.37×10^{-4} = ...

(a) 0.00237 (b) 0.000237 (c) 23700 (d) 0.0000237

37 If 0.00079 = 7.9 a , then a = ...

(a) 10^3 (b) 10^{-3} (c) 10^{-4} (d) 10^4

38 If $0.0000503 = m \times 10^{-5}$, then m = ...

(a) 503 (b) 5.03 (c) 50.3 (d) 0.503

39 📖 If the thickness of a sheet of paper is 0.012 cm. , then a ream of 400 sheets is of height .....

(a) 48×10^{-3} cm. (b) 48×10^{-2} cm. (c) 4.8×10^{0} cm. (d) 48 cm.

40 Which of the following equals $\frac{1}{2}$ milliard ?

(a) 50×10^8 (b) 5×10^8 (c) 0.5×10^8 (d) 500×10^7

41 📖 Which of the following is the greatest ?

(a) 6.3×10^5 (b) 9.8×10^4 (c) 5.2×10^5 (d) 7.3×10^4

42 Which of the following is the smallest ?

(a) 0.6×10^5 (b) 0.25×10^5 (c) 7×10^4 (d) 17.5×10^4

43 $6\,000 \times 50$ = ...

(a) 300×10^2 (b) 30×10^5 (c) 3×10^5 (d) 30×10^4

44 45×900 = ...

(a) 4.05×10^2 (b) 4.05×10^3 (c) 4.05×10^4 (d) 45×10^2

45 0.7×0.005 = ...

(a) 3.5×10^3 (b) 3.5×10^{-2} (c) 3.5×10^2 (d) 3.5×10^{-3}

46 📖 The quarter of the number 4^{20} = ...

(a) 4^5 (b) 4^{10} (c) 4^{19} (d) 2^{10}

2. Answer the following:

1. Find the value of the following in the simplest form : $\frac{2^4 \times 2^5}{2^6}$

2. Find the value of the following in the simplest form : $\frac{a^5 \times a^8}{a^3 \times a^2 \times a^4}$ (where $a \neq$ zero)

3. Calculate : $\left(\frac{9^3 \times 9}{9^5}\right)^{-3}$

4. Calculate : $\left(\frac{3^4 \times 7^2}{7^3 \times 3^2}\right)^{-1}$

5. Calculate : $\frac{(10)^2 \times (0.01)^3}{(10)^{-3}}$

6. Find the value of the following in the simplest form : $\left(-\frac{3}{5}\right)^3 \times \left(\frac{-25}{27}\right)$

7. Put the expression : $\left(\frac{1}{2}\right)^2 \times \left(\frac{-1}{2}\right)^3$ in its simplest form.

8. If $x = \frac{1}{2}$, $y = \frac{1}{3}$, find the numerical value of : $(x + y)^{-2}$

9. If $x = -\frac{1}{2}$, $y = -\frac{3}{4}$, find the value of : $\left(\frac{y}{x^2}\right)^{-2}$

10. Simplify to the simplest form : $(x^2)^{-3} \div (x^{-1})^2$ where $x \neq 0$

11. Find the value of the following in the simplest form : $\left(\frac{-2}{3}\right)^3 \times \left(\frac{1}{3}\right)^3 \div \left(\frac{-2}{9}\right)^2$

12. If $x = \frac{-3}{2}$, $y = \frac{1}{2}$, $z = \frac{4}{3}$ find in the simplest form the value of : $x^2 y^2 z^2$

13. Calculate the value of : $\left(\frac{-2}{5}\right)^x + \left(\frac{2}{5}\right)^y$ If $x = 4$, $y = 3$

14. If $a = -\frac{1}{2}$, $b = 2$ and $c = \frac{3}{4}$, find the numerical value of : $a^3 b^2 + b^2 c - 8 abc$

15. Write the following number in the standard form : 581 200 000 000

16. Find the result in the standard form : $(2.3 \times 10^3) + (6.3 \times 10^4)$

17. Write the result of : $(4.4 \times 10^3) \times (2 \times 10)^5$ in the standard form.

18. Calculate the value of the following in the standard form : $(3.6 \times 10^8) \div (1.8 \times 10^3)$

Model 1

Total Mark 5

1 Choose the correct answer from the given ones : **(3 Marks)**

1 The additive inverse of the number $\left(-\frac{2}{3}\right)^4$ is .....

(a) $\frac{2}{3}$ (b) $-\frac{16}{81}$ (c) $\frac{81}{16}$ (d) $-\frac{81}{16}$

2 If $0.0028 = 2.8 \times a$, then a = ...

(a) 3 (b) -3 (c) 10^3 (d) 10^{-3}

3 If $2^{10} + 2^{10} = 2^k$, then k = ...

(a) 4 (b) 20 (c) 100 (d) 11

---

2 Simplify : $\frac{b^3 \times b^{-5}}{b^{-2} \times b^6}$ **(2 Marks)**

, then find the value of the result when b = 2

Model 2

Total Mark 5

1 Choose the correct answer from the given ones : **(3 Marks)**

1 If $2^{-5} \times 3^{-5} = 6^k$, then k = ...

(a) 6 (b) -10 (c) 25 (d) -5

2 3.04×10^7 = ...

(a) 340 000 (b) 304 000 (c) 3 400 000 (d) 30 400 000

3 $4\,x^{-1}\,y^{-2} = \frac{4}{.....}$ (where $x \neq 0$, $y \neq 0$)

(a) $y^2\,x^{-1}$ (b) $x\,y^{-2}$ (c) $x\,y^2$ (d) $y\,x^2$

---

2 Simplify to the simplest form : $\frac{4^{n+1} \times 3^{n-1}}{12^n}$ **(2 Marks)**

Model 3

Total Mark 5

1 **Choose the correct answer from the given ones :** **(3 Marks)**

1 $\left(-\frac{2}{3}\right)^{-3}$ = ...

(a) $\frac{-8}{27}$ (b) $\frac{-27}{8}$ (c) $\frac{8}{27}$ (d) $\frac{27}{8}$

2 Half the number 2^{20} = ...

(a) 2^{18} (b) 2^{19} (c) 2^{4} (d) 2^{5}

3 The number which is in standard form from the following is .....

(a) 11×10^{8} (b) 9.7×10^{-5} (c) 10.2×10^{-2} (d) 0.87×10^{8}

2 If $x = \frac{-3}{2}$, $y = \frac{1}{2}$, $z = \frac{4}{3}$ find in the simplest form the value of : $x^2 y^2 z^2$

(2 Marks)

Model 4

Total Mark 5

1 **Choose the correct answer from the given ones :** **(3 Marks)**

1 $a^{-4} \div a^{-6}$ = ... (Where $a \neq$ zero)

(a) a^{-10} (b) a^{-2} (c) a^{2} (d) a^{10}

2 The multiplicative inverse of the number $(-3)^{zero}$ is .....

(a) 3 (b) 3 (c) – 1 (d) 1

3 If $3500 = 3.5 \times 10^{n}$, then n = ...

(a) 3 (b) – 3 (c) 1 (d) 2

2 If $x = \frac{1}{2}$, $y = \frac{1}{3}$, find the numerical value of : $(x + y)^{-2}$

(2 Marks)

The Answers: (1.Choose)

1 (c)	2 (d)	3 (a)	4 (b)	5 (c)
6 (b)	7 (c)	8 (c)	9 (b)	10 (b)
11 (a)	12 (d)	13 (c)	14 (d)	
15 (c)	16 (a)	17 (d)	18 (c)	
19 (d)	20 (c)	21 (c)	22 (d)	
23 (b)	24 (c)	25 (c)	26 (c)	
27 (b)	28 (b)	29 (d)	30 (d)	
31 (d)	32 (d)	33 (b)	34 (a)	
35 (d)	36 (b)	37 (c)	38 (b)	
39 (c)	40 (b)	41 (a)	42 (b)	
43 (c)	44 (c)	45 (d)	46 (c)	

1. Choose the correct answer:

1 The sum of measures of the interior angles of a polygon of n sides equals .....

(a) $n \times 180°$ (b) $(n-2) \times 180°$ (c) $\frac{(n-2) \times 180°}{2}$ (d) $\frac{(n-2) \times 180°}{2n}$

2 The measure of the interior angle of a regular polygon of n sides equals .....

(a) $\frac{(n-2) \times 90°}{n}$ (b) $\frac{(n-2) \times 180°}{2}$ (c) $\frac{(n-2) \times 180°}{n}$ (d) $180° \times (n-1)$

3 The measure of the interior angle of the regular polygon of 10 sides equals .....

(a) 72° (b) 108° (c) 144° (d) 150°

4 The measure of the interior angle of a regular polygon of 18 sides equals .....

(a) 130° (b) 140° (c) 150° (d) 160°

5 If the measure of an interior angle of a regular polygon is 135° , then the number of its sides is .....

(a) 6 (b) 4 (c) 7 (d) 8

6 The sum of measures of the exterior angles of the triangle equals .....

(a) 90° (b) 180° (c) 360° (d) 720°

7 In the quadrilateral ABCD , if $m(\angle A) = 2\,m(\angle B) = m(\angle C) = 96°$, then $m(\angle D) =$ .....

(a) 96° (b) 48° (c) 120° (d) 144°

8 ABCD is a parallelogram in which : m (∠ A) = 50° , then m (∠ C) = ...

(a) 50° (b) 60° (c) 130° (d) 150°

9 ABCD is a parallelogram in which : m (∠ A) + m (∠ C) = 140°
, then m (∠ B) = ...

(a) 70° (b) 40° (c) 110° (d) 220°

10 If the lengths of two consecutive sides of a parallelogram are 3 cm. and 5 cm. , then its perimeter equals ..... cm.

(a) 12 (b) 14 (c) 16 (d) 18

11 If the perimeter of a parallelogram is 25 cm. and if one of its sides is of length 7 cm. , then the consecutive side is of length ..... cm.

(a) 7 (b) 18 (c) 12.5 (d) 5.5

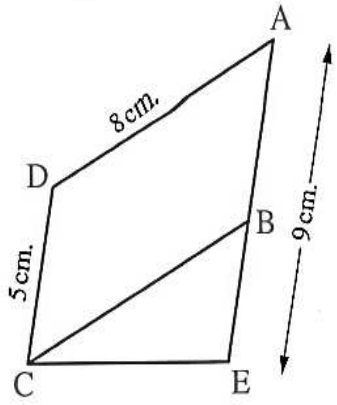
12 **In the opposite figure :**

If ABCD is a parallelogram

, $E \in \overrightarrow{AB}$, CD = 5 cm., AE = 9 cm.

, AD = 8 cm., the perimeter of Δ BEC = 18 cm.

, then the length of $\overline{EC}$ = ... cm.



(a) 8 (b) 6 (c) 5 (d) 4

13 The two diagonals of a rectangle .....

(a) are perpendicular.
(b) are equal in length.
(c) are perpendicular and equal in length.
(d) bisect its interior angles.

14 The two diagonals of a rhombus are .....

(a) perpendicular and not equal in length.
(b) equal in length and not perpendicular.
(c) perpendicular and equal in length.
(d) not equal in length and not perpendicular.

15 The two diagonals of the square are .....

(a) just perpendicular.
(b) just equal in length.
(c) perpendicular and equal in length.
(d) not equal in length and not perpendicular.

16 The adjacent sides are equal in length in a parallelogram, then the figure is a .....

(a) square. (b) rhombus. (c) rectangle. (d) trapezium.

17 If ABCD is a rectangle in which AC = 5 cm., then BD = ... cm.

(a) 2.5 (b) 5 (c) 10 (d) 20

18 If ABCD is a square, then m (∠ CAB) = ...

(a) 90° (b) 45° (c) 60° (d) 30°

19 If ABCD is a parallelogram in which m (∠ A) = m (∠ B), then ABCD is a .....

(a) rectangle. (b) rhombus. (c) square. (d) trapezium.

20 If ABCD is a rhombus in which m (∠ ACB) = 32°, then m (∠ D) = ...

(a) 32° (b) 64° (c) 116° (d) 26°

21 The two vertically opposite angles are .....

(a) complementary. (b) supplementary.

(c) adjacent. (d) equal in measure.

22 The sum of measures of the accumulative angles at a point equals .....

(a) 45° (b) 90° (c) 180° (d) 360°

23 The sum of measures of the interior angles of any quadrilateral equals .....

(a) 180° (b) 170° (c) 90° (d) 360°

24 The number of diagonals of the quadrilateral equals .....

(a) 2 (b) 3 (c) 4 (d) 5

25 If ABCD is a square , then m (∠ CAD) = ...

(a) 90° (b) 60° (c) 45° (d) 30°

26 The two diagonals in the rectangle are .....

(a) parallel. (b) perpendicular.

(c) equal in length. (d) equal in length and perpendicular.

27 The rhombus whose two diagonals are equal in length is called .....

(a) square. (b) rectangle. (c) parallelogram. (d) trapezium.

28 The rhombus whose perimeter is 60 cm. , its side length equals ..... cm.

(a) 20 (b) 18 (c) 15 (d) 10

29 The measure of the interior angle of a regular pentagon equals .....

(a) 135° (b) 540° (c) 108° (d) 110°

30 The measure of the interior angle of a regular hexagon equals .....

(a) 60° (b) 108° (c) 120° (d) 135°

31 The number of diagonals of pentagon equals .....

(a) 3 (b) 5 (c) 7 (d) 9

32 The measure of the exterior angle of a regular polygon is 45° , then the number of its sides is .....

(a) 3 sides. (b) 6 sides. (c) 8 sides. (d) 9 sides.

33 The measure of the interior angle of a regular polygon of 10 sides equals .....

(a) 72° (b) 108° (c) 144° (d) 150°

34 The perimeter of a square of side length 5 cm. is ..... cm.

(a) 10 (b) 20 (c) 15 (d) 25

35 The sum of measures of two consecutive angles in the parallelogram is .....

(a) 90° (b) 180° (c) 120° (d) 360°

36 The parallelogram whose angle is right is called .....

(a) square. (b) rhombus. (c) rectangle. (d) trapezium.

37 If two adjacent sides are equal in a parallelogram , then the figure is .....

(a) square. (b) rhombus. (c) rectangle. (d) trapezium.

38 ABCD is a parallelogram in which m (∠ A) + m (∠ C) = 140° , then m (∠ B) = ...

(a) 40° (b) 140° (c) 110° (d) 70°

39 The two diagonals are equal in length and perpendicular in .....

(a) rhombus. (b) rectangle. (c) square. (d) parallelogram.

40 The two diagonals are equal in length and not perpendicular in .....

(a) square. (b) rectangle. (c) rhombus. (d) parallelogram.

41 The diagonal of the square divides the vertex angle into two angles , the measure of each of them is .....

(a) 45° (b) 30° (c) 90° (d) 60°

42 The diagonal of the square make an angle of measure ..... with any of its sides.

(a) 45° (b) 60° (c) 90° (d) 120°

43 ABCD is a parallelogram in which m (∠ A) = 50° , then m (∠ B) = ...

(a) 50° (b) 130° (c) 180° (d) 90°

44 The sum of measures of the interior angles of a triangle equals .....

(a) 180° (b) 360° (c) 90° (d) 270°

45 The sum of measures of the interior angles of a triangle equals the measure of ..... angle.

(a) right. (b) straight. (c) acute. (d) reflex.

2. Answer the following:

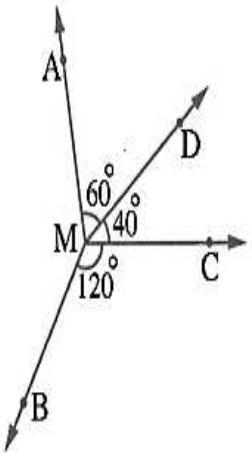
1 **In the opposite figure :**

$m(\angle BMC) = 120°$

, $m(\angle CMD) = 40°$

, $m(\angle DMA) = 60°$

Find : $m(\angle AMB)$



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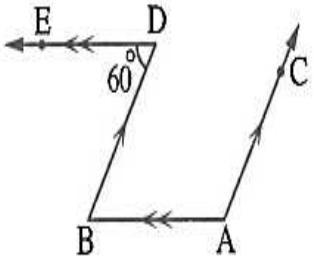
2 **In the opposite figure :**

If $\overrightarrow{DE} // \overline{AB}$

, $\overrightarrow{AC} // \overline{BD}$

, $m(\angle EDB) = 60°$

Find : $m(\angle B)$, $m(\angle A)$



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3 **In the opposite figure :**

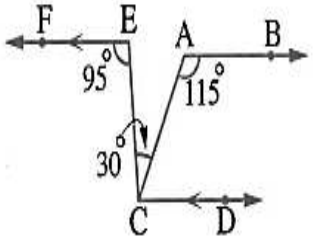
$\overrightarrow{EF} // \overrightarrow{CD}$

, $m(\angle CEF) = 95°$

, $m(\angle ACE) = 30°$

, $m(\angle BAC) = 115°$

Prove that : $\overrightarrow{AB} // \overrightarrow{EF}$



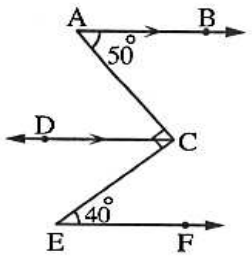
4 **In the opposite figure :**

$\overrightarrow{AB} // \overrightarrow{CD}$

, m (∠ A) = 50° , m (∠ ACE) = 90°

, m (∠ E) = 40°

Prove that : $\overrightarrow{CD} // \overrightarrow{EF}$



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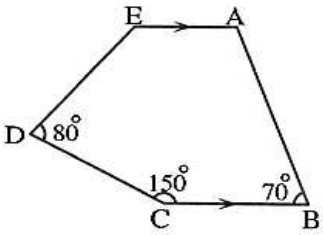
5 **In the opposite figure :**

$\overline{AE} // \overline{BC}$, m (∠ B) = 70°

, m (∠ C) = 150°

, m (∠ D) = 80°

Find by proof : m (∠ E)



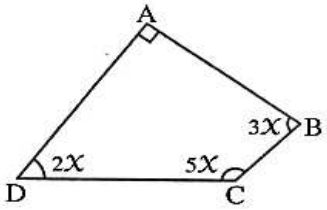
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6 **In the opposite figure :**

ABCD is a quadrilateral in which

, m (∠ A) = 90°

Find : The value of x

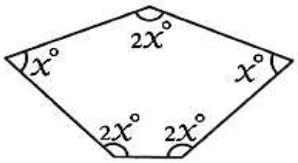


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7 **In the opposite figure :**

Find with giving reason

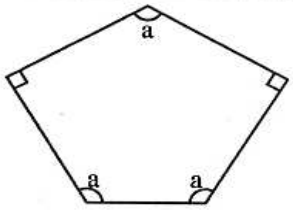
The value of x



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8 **In the opposite figure :**

Find : The value of a



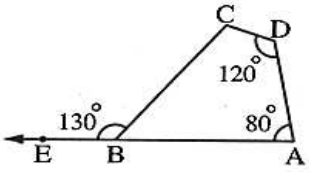
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9 **In the opposite figure :**

$E \in \overrightarrow{AB}$, m (∠ A) = 80°

, m (∠ D) = 120° , m (∠ CBE) = 130°

Find : m (∠ C)



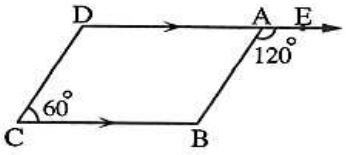
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10 **In the opposite figure :**

$E \in \overrightarrow{DA}$, m (∠ EAB) = 120°

, m (∠ C) = 60° , $\overrightarrow{DA} // \overline{CB}$

Prove that : ABCD is a parallelogram



11 **In the opposite figure :**

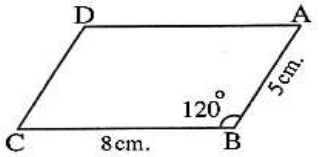
ABCD is a parallelogram

in which : AB = 5 cm.

, BC = 8 cm. , m (∠ B) = 120°

Find : [1] The perimeter of the parallelogram ABCD

[2] m (∠ C)



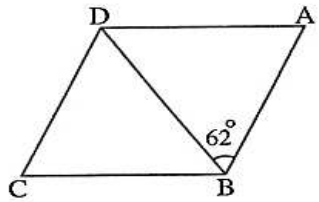
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12 **In the opposite figure :**

ABCD is a rhombus in which :

, m (∠ ABD) = 62°

Find with proof : m (∠ A)



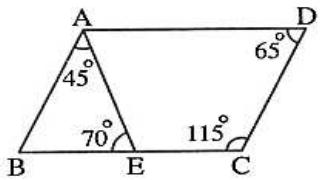
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13 **In the opposite figure :**

m (∠ BAE) = 45° , m (∠ AEB) = 70°

, m (∠ D) = 65° , m (∠ C) = 115°

Prove that : ABCD is a parallelogram.



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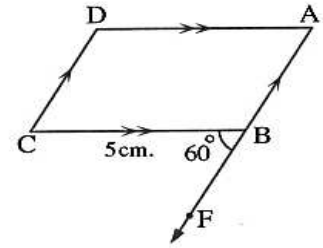
14 **In the opposite figure :**

ABCD is a parallelogram

, m (∠ CBF) = 60°

, BC = 5 cm. , $F \in \overrightarrow{AB}$

Find by proof : m (∠ D) , the length of $\overline{AD}$



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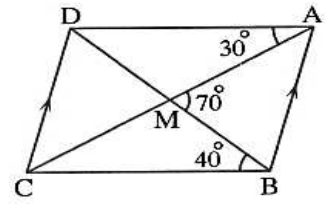
15 **In the opposite figure :**

$\overline{AB} \parallel \overline{DC}$, $\overline{AC} \cap \overline{BD} = \{M\}$

, m (∠ DAC) = 30° , m (∠ DBC) = 40°

, m (∠ AMB) = 70°

Prove that : ABCD is a parallelogram.



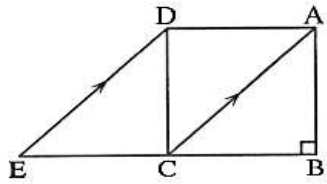
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16 **In the opposite figure :**

ABCD ia a square , $E \in \overrightarrow{BC}$

where : $\overline{AC} \parallel \overline{DE}$

Prove that : ACED is a parallelogram.



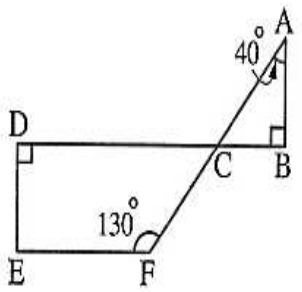
17 **In the opposite figure :**

$\overline{AB}$, $\overline{DE}$ are perpendicular

on $\overline{BD}$, $\overline{BD} \cap \overline{AF} = \{C\}$

, $m(\angle A) = 40°$, $m(\angle F) = 130°$

Find by proof : $m(\angle E)$



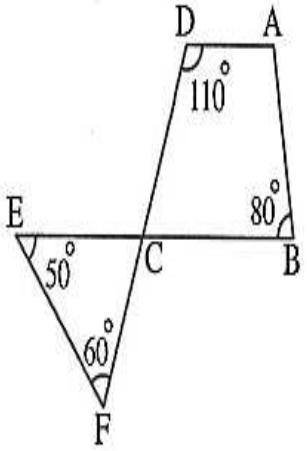
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18 **In the opposite figure :**

$m(\angle E) = 50°$, $m(\angle F) = 60°$

, $m(\angle B) = 80°$, $m(\angle D) = 110°$

Find : $m(\angle A)$

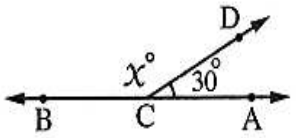


Model 1

Total Mark 5

1 Choose the correct answer from the given ones : (3 Marks)

1 **In the opposite figure :**



If $\overleftrightarrow{AB} \cap \overrightarrow{CD} = \{C\}$, $m(\angle ACD) = 30°$

, then x = ...

(a) 30° (b) 150° (c) 60° (d) 90°

2 The rhombus in which its two diagonals are equal in length is called .....

(a) a parallelogram. (b) a square.

(c) a rectangle. (d) a trapezium.

3 If two straight lines intersect , then each two vertically opposite angles are .....

(a) equal in measure. (b) complementary.

(c) supplementary. (d) adjacent.

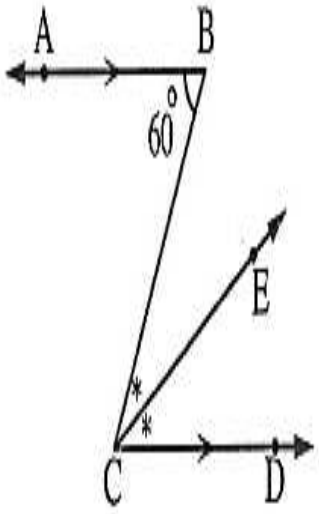
---

2 In the opposite figure : (2 Marks)

$\overrightarrow{BA} // \overrightarrow{CD}$, $m(\angle ABC) = 60°$

, $\overrightarrow{CE}$ bisects $\angle BCD$

Find : $m(\angle ECD)$



Model 2

Total Mark 5

1 **Choose the correct answer from the given ones :** (3 Marks)

1 The number of diagonals of the pentagon is .....

(a) 5 (b) 9 (c) 15 (d) 2

2 If ABCD is a parallelogram , $m(\angle B) + m(\angle C) =$ .....

(a) 70° (b) 180° (c) 90° (d) 360°

3 The parallelogram in which the two diagonals are equal in length is .....

(a) a trapezium. (b) a rhombus. (c) a rectangle. (d) a square.

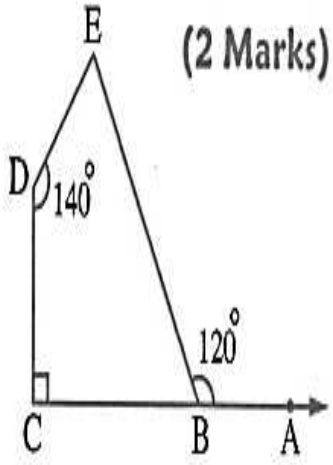
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2 **In the opposite figure :** (2 Marks)

$A \in \overrightarrow{CB}$, $m(\angle D) = 140°$

, $m(\angle ABE) = 120°$, $\overline{DC} \perp \overline{CB}$

Find : $m(\angle E)$



Model 3

Total Mark 5

1 **Choose the correct answer from the given ones :** (3 Marks)

1 The sum of measures of the accumulative angles at a point equals .....

(a) 45° (b) 90° (c) 180° (d) 360°

2 The measure of the interior angle of a regular hexagon equals .....

(a) 60° (b) 108° (c) 120° (d) 135°

3 The parallelogram whose angle is right is called .....

(a) square. (b) rhombus. (c) rectangle. (d) trapezium.

---

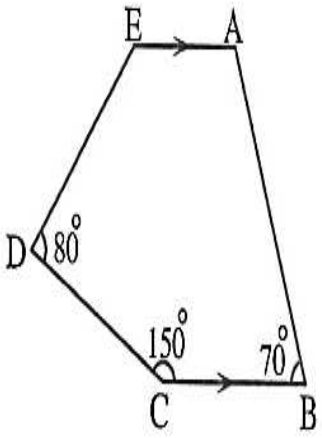
2 **In the opposite figure :**

$\overline{AE} // \overline{BC}$, $m(\angle B) = 70°$

, $m(\angle C) = 150°$

, $m(\angle D) = 80°$

Find by proof : $m(\angle E)$



Model 4

Total Mark 5

1 Choose the correct answer from the given ones : (3 Marks)

1 The sum of measures of the interior angles of any quadrilateral equals .....

(a) 180° (b) 170° (c) 90° (d) 360°

2 The rhombus whose two diagonals are equal in length is called .....

(a) square. (b) rectangle. (c) parallelogram. (d) trapezium.

3 The measure of the exterior angle of a regular polygon is 45° , then the number of its sides is .....

(a) 3 sides. (b) 6 sides. (c) 8 sides. (d) 9 sides.

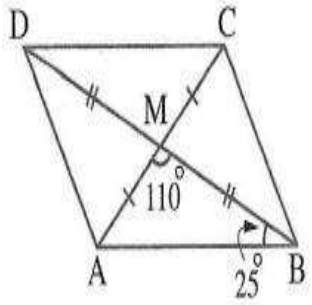
---

2 In the opposite figure : (2 Marks)

ABCD is a quadrilateral its two diagonals intersect at M

, m (∠ AMB) = 110° , m (∠ MBA) = 25°

, MA = MC , MB = MD



1 **Prove that :** ABCD is a parallelogram

2 **Find :** m (∠ ACD)

The Answers:(2.Essay questions)

1 $\because m(\angle AMB) + (\angle CMD) + m(\angle DMA) + m(\angle CMB) = 360°$

$\therefore m(\angle AMB) + 40° + 60° + 120° = 360°$

$\therefore m(\angle AMB) = 360° - 220° = 140°$ (The req.)

---

2 $\because \overrightarrow{DE} // \overrightarrow{AB}$, $\overleftrightarrow{BD}$ is a transversal to them

$\therefore m(\angle B) = m(\angle EDB) = 60°$ (Alternate angles) (First req.)

, $\because \overrightarrow{BD} // \overrightarrow{AC}$, $\overleftrightarrow{AB}$ is a transversal to them.

$\therefore m(\angle A) + m(\angle B) = 180°$ (two interior angles in the same side of the transversal)

$\therefore m(\angle A) = 180° - 60° = 120°$ (Second req.)

---

3 $\because \overrightarrow{EF} // \overrightarrow{CD}$, $\overleftrightarrow{EC}$ is a transversal to them.

$\therefore m(\angle ECD) = m(\angle CEF) = 95°$ (Alternate angles)

$\therefore m(\angle ACD) = 95° - 30° = 65°$

$\therefore m(\angle ACD) + m(\angle A) = 65° + 115° = 180°$

and they are interior angles in the same side of the transversal

$\therefore \overrightarrow{AB} // \overrightarrow{CD}$, $\because \overrightarrow{CD} // \overrightarrow{EF}$

$\therefore \overrightarrow{AB} // \overrightarrow{EF}$ (The req.)

---

4 $\because \overrightarrow{AB} // \overrightarrow{CD}$, $\overleftrightarrow{AC}$ is a transversal to them

$\therefore m(\angle ACD) = m(\angle A) = 50°$ (Alternate angles)

, $\because m(\angle ACE) = 90°$

$\therefore m(\angle DCE) = 90° - 50° = 40°$

$\therefore m(\angle DCE) = m(\angle E)$ and they are alternate angles.

$\therefore \overrightarrow{CD} // \overrightarrow{EF}$ (The req.)

---

5 $\because \overrightarrow{AE} // \overrightarrow{BC}$, $\overleftrightarrow{AB}$ is a transversal to them.

$\therefore m(\angle A) + m(\angle B) = 180°$ (Two interior angles in the same side of the transversal)

$\therefore m(\angle A) = 180° - 70° = 110°$

, $\because$ the sum of the measures of the interior angles of the pentagon ABCDE = 540°

$\therefore m(\angle E) = 540° - (70° + 150° + 80° + 110°) = 130°$ (The req.)

---

6 $\because$ The sum of the measures of the interior angles of the quadrilateral ABCD = 360°

$\therefore 3x + 5x + 2x + 90° = 360°$

$\therefore 10x + 90° = 360°$

$\therefore 10x = 360° - 90° = 270°$

$\therefore x = \frac{270°}{10°} = 27°$ (The req.)

---

7 $\because$ The sum of the measures of the interior angles of the pentagon = 540°

$\therefore x + 2x + 2x + x + 2x = 540°$

$\therefore 8x = 540°$

$\therefore x = \frac{540°}{8} = 67.5°$ (The req.)

---

8 $\because$ The sum of the measures of the interior angles of the pentagon = 540°

$\therefore a + a + a + 90° + 90° = 540°$

$\therefore 3a + 180° = 540°$

$\therefore 3a = 540° - 180° = 360°$

$\therefore a = \frac{360°}{3} = 120°$ (The req.)

---

9 $\because E \in \overrightarrow{AB}$

$\therefore m(\angle ABC) = 180° - 130° = 50°$

, $\because$ the sum of the measures of the interior angles of the quadrilateral ABCD = 360°

$\therefore m(\angle C) = 360° - (50° + 80° + 120°) = 110°$ (The req.)

---

10 $\because \overrightarrow{DE} // \overrightarrow{BC}$, $\overleftrightarrow{AB}$ is a transversal to them

$\therefore m(\angle B) = m(\angle BAE) = 120°$ (Alternate angles)

, $\because m(\angle B) + m(\angle C) = 120° + 60° = 180°$

and they are interior angles in the same side of the transversal

$\therefore \overrightarrow{AB} // \overrightarrow{CD}$, $\because \overrightarrow{AD} // \overrightarrow{BC}$

$\therefore$ ABCD is a parallelogram. (Q.E.D.)

---

11 The perimeter of the parallelogram ABCD

$= (AB + BC) \times 2$

$= (5 + 8) \times 2 = 13 \times 2 = 26$ cm. (First req.)

$\because$ ABCD is a parallelogram

$\therefore m(\angle B) + m(\angle C) = 180°$

$\therefore m(\angle C) = 180° - 120° = 60°$ (Second req.)

12 $\because$ ABCD is a rhombus , $\overline{BD}$ is a diagonal

$\therefore$ m ($\angle$ ABC) = 2 m ($\angle$ ABD) = 2 × 62° = 124°

$\therefore$ m ($\angle$ A) = 180° − 124° = 56° (The req.)

---

13 In Δ ABE : m ($\angle$ B) = 180° − (45° + 70°) = 65°

, $\because$ m ($\angle$ D) + m ($\angle$ C) = 65° + 115° = 180°

and they are interior angles in the same side of the transversal

$\therefore$ $\overline{AD} \parallel \overline{BC}$ (1)

, $\because$ m ($\angle$ B) + m ($\angle$ C) = 65° + 115° = 180°

and they are interior angles in the same side of the transversal

$\therefore$ $\overline{AB} \parallel \overline{CD}$ (2)

, from (1) and (2) :

$\therefore$ ABCD is a parallelogram. (Q.E.D.)

---

14 $\because$ F $\in \overrightarrow{AB}$

$\therefore$ m ($\angle$ ABC) = 180° − 60° = 120°

, $\because$ ABCD is a parallelogram

$\therefore$ m ($\angle$ D) = m ($\angle$ ABC) = 120° (First req.)

, AD = BC = 5 cm. (Second req.)

---

15 $\because$ M $\in \overline{AC}$

$\therefore$ m ($\angle$ BMC) = 180° − 70° = 110°

$\therefore$ in Δ MBC :

m ($\angle$ BCM) = 180° − (110° + 40°) = 30°

$\therefore$ m ($\angle$ BCM) = m ($\angle$ CAD)

and they are alternate angles

$\therefore$ $\overline{AD} \parallel \overline{BC}$

, $\because$ $\overline{AB} \parallel \overline{DC}$

$\therefore$ ABCD is a parallelogram. (Q.E.D.)

---

16 $\because$ $\overline{AD} \parallel \overline{BC}$ (Two opposite sides in the square)

, E $\in \overrightarrow{BC}$ $\therefore$ $\overline{AD} \parallel \overline{CE}$

, $\because$ $\overline{AC} \parallel \overline{DE}$ (Given)

$\therefore$ ACED is a parallelogram. (Q.E.D.)